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Forest Pest Conditions In The Maritimes 1983

Laszlo P. Magasi

Environment Canada | Environnement Canada
0016033H DEST PVM EXCH COPY 03
SD 391 C36
VOL ISS 149
INFORMATION REPORT (MARITIMES FORES
T RESEARCH CENTRE)

Information Report M-X-149
Maritimes Forest Reseach Centre

84- 4274 /

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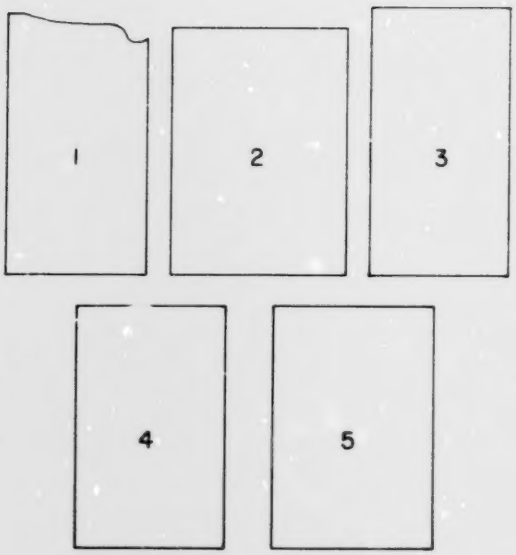
The Maritimes Forest Research Centre (MFRC) is one of six regional establishments of the Canadian Forestry Service, within Environment Canada. The Centre conducts a program of work directed toward the solution of major forestry problems and the development of more effective forest management techniques for use in the Maritime Provinces.

The program consists of two major elements - research and development, and technical and information services. Most research and development work is undertaken in direct response to the needs of forest management agencies, with the aim of improving the protection, growth, and value of the region's forest resource for a variety of consumptive and non-consumptive uses; studies are often carried out jointly with provincial governments and industry. The Centre's technical and information services are designed to bring research results to the attention of potential users, to demonstrate new and improved forest management techniques, to assist management agencies in solving day-to-day problems, and to keep the public fully informed on the work of the Maritimes Forest Research Centre.



EASTERN LARCH BEETLE

1) Adult
2) Infested stand
3) Larvae
4) Larval galleries
5) Beetle-killed tree

FOREST PEST CONDITIONS IN THE MARITIMES IN 1983

by

Laszlo P. Magasi

Maritimes Forest Research Centre

Fredericton, New Brunswick

Information Report M-X-149

Canadian Forestry Service

Environment Canada

1984

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Catalogue no. Fo46-19/149E
ISBN 0-662-13226-2
ISSN 0704-769X

Copies of this report may be obtained from

Maritimes Forest Research Centre
Canadian Forestry Service
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Une copie française de ce rapport peut être mise à la disponibilité de quiconque en fait la demande.

This report is dedicated to the
memory
of

Carl L Burlock

1931-1983

by the members of the

Forest Insect and Disease Survey
Maritimes Region

who lost a good friend and a respected colleague

ABSTRACT

This report reviews the status of forest insects and diseases in the Maritimes Region in 1983, damage related to forest inventory data, and a forecast of conditions for 1984, when appropriate. Fourteen economically important pest conditions are discussed in detail. A chapter on special surveys provides information on the results of a red pine plantation assessment survey, cone and seed damage of white spruce, damage assessment in fir-spruce stands, and cyclical reviews for specific pests. Information on other organisms is listed in tabular form. A list of forest-pest related publications and reports is included. More detailed information is available on request from the Maritimes Forest Research Centre.

RESUME

Ce rapport fait le bilan des insects forestiers et de maladies des arbres dans la région des maritimes en 1983, y compris les dégâts de nature économique, et donne un apercu des conditions prévues pour 1984, lorsqu'approprié. L'auteur traite en détail de 14 ravageurs d'importance. Un chapitre affecté aux inventaires spéciaux donne de l'information sur les résultats d'une évaluation sur des plantations de pin rouge, les dégâts aux cônes et semences d'épinette blanche, les dégâts observés dans des peuplements mixtes sapin-épinette, et fait une revue cyclique de certains ravageurs. Il y inclut également une compilation de rapports et de publications traitant de ravageurs forestiers. De plus amples renseignements sont disponibles sur demande au Centre de recherches forestières des Maritimes.

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	1
IMPORTANT AND CONSPICUOUS FOREST PESTS	3
SPRUCE BUDWORM	4
SPRUCE BUD MOTH	7
BARK BEETLES OF CONIFERS	7
Spruce Beetle	7
Eastern Larch Beetle	8
CANKERS OF CONIFERS	8
European Larch Canker	8
Scleroderris Canker	9
SIROCOCCUS SHOOT BLIGHT	10
ARMILLARIA ROOT ROT	12
JACK PINE BUDWORM	12
GYPSY MOTH	12
FOREST TENT CATERPILLAR	16
HARDWOOD DEFOLIATORS	18
Oak Leaf Shredder and Oak Leafroller	18
Bruce Spanworm	18
Fall Cankerworm	18
Winter Moth	19
Orangehumped Mapleworm	19
DUTCH ELM DISEASE	19
DETERIORATION OF BIRCH	20
Air Pollutants	20
Bronze Birch Borer	21
Birch Ambrosia Beetle	21
Birch Scale	21
CHRISTMAS TREE PESTS	21
Balsam Gall Midge	21
Balsam Twig Aphid	21
NURSERY AND GREENHOUSE PROBLEMS	22
Insects	22
Fungi	22
Abiotic Conditions	22

SPECIAL SURVEYS..... 23

FOREST PEST ASSESSMENT IN PLANTATIONS..... 24

PLANTATION SURVEY OF RED PINE..... 24

CONE AND SEED INSECTS AND DISEASES OF WHITE SPRUCE..... 27

DAMAGE ASSESSMENT IN FIR-SPRUCE STANDS..... 27

CYCLICAL REVIEWS FOR SPECIFIC PESTS..... 28

Northern Pitch Twig Moth..... 28
Balsam Shootboring Sawfly..... 29
Larch Needle Casts..... 29
Eastern Dwarf Mistletoe..... 29

ACKNOWLEDGEMENTS..... 31

LIST OF PUBLICATIONS..... 32

OTHER INSECTS AND DISEASES..... 35

INTRODUCTION

Some of the objectives of the Forest Insect and Disease Survey are to monitor insect and disease conditions, determine their effects on the forest, and report on the status of the important and more common pests. In the Maritimes, this information is disseminated to interested agencies and individuals through periodical reports such as Seasonal Highlights, Technical Notes, Information Reports, and the Annual Report of the Forest Insect and Disease Survey.

In this report, pest conditions in 1983 are described and, where appropriate, related to provincial forest inventory data; operational control programs against the spruce budworm are summarized; and a list of reports and publications relating to forest-pest conditions is included.

The report aims to provide forest managers with information on pest conditions in the Maritime Provinces, early enough to be considered in management decisions before the start of the 1984 field season. Insects and diseases that were widespread and caused considerable concern in 1983 are discussed in detail, others are presented in tabular form. More information on these and on other specific conditions will be provided upon request from the Maritimes Forest Research Centre.

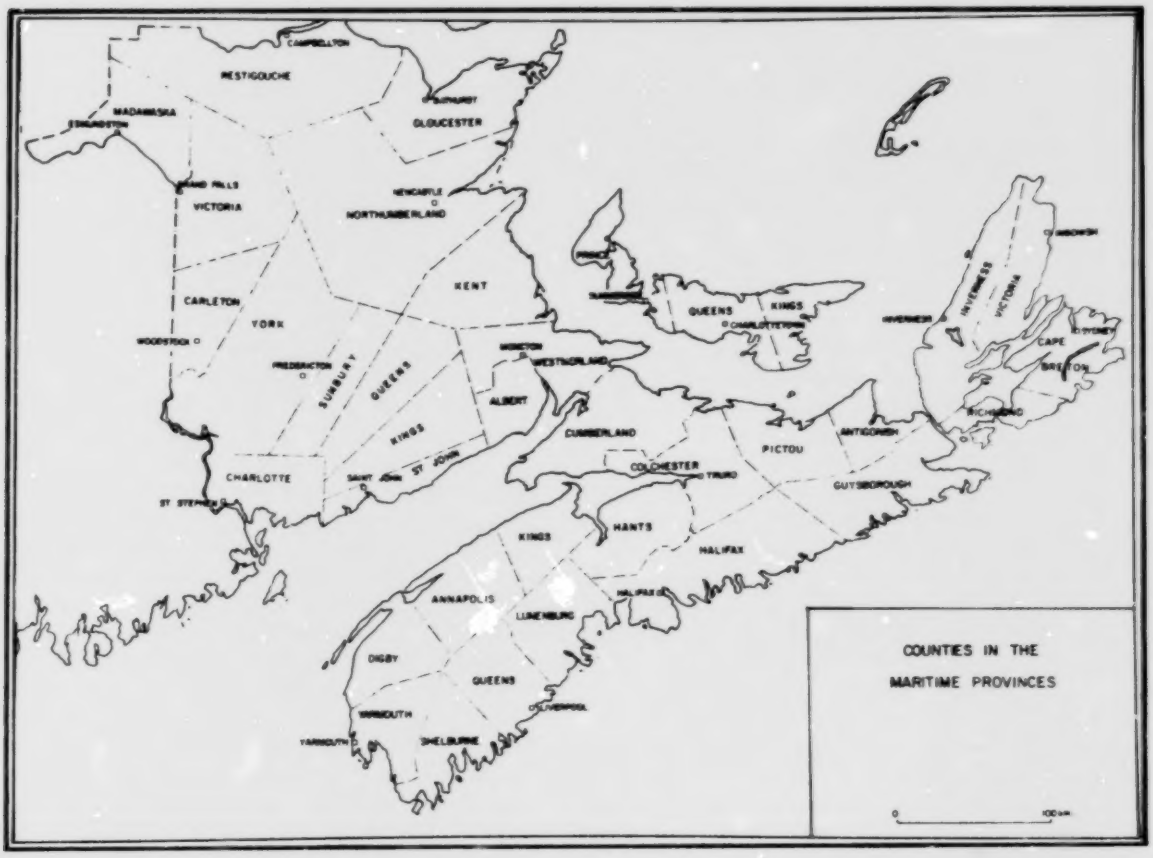
Last year, for the first time, we included a chapter on special surveys to report on some of our projects that have implication in forest management but did not fit our previous reporting format. This chapter is presented again. In 1983, special surveys included a red pine plantation assessment, a continuation of the study of seed and cone pests, and cyclical reviews for specific pests. Surveys to assess damage to specific forest tree species were initiated in 1983, fir-spruce stands being our first choice.

We attempt to add some extra information on the pests discussed, partly in response to suggestions, partly because requests for information indicate the need for this, now that our readership has expanded beyond our traditional clientele of the forestry community. This, we hope, will place the organisms in a better perspective and provide readers with some background and a clearer understanding of some of the concerns we express. Comments on any part of the report for improved presentation are always welcome.

Two maps are included to help the reader locate areas mentioned in the report, one shows the counties of the three provinces, and the other indicates the provincial forest services' forest inventory subdivisions.

In recent years, efforts towards collecting and reporting information in quantitative terms have been emphasized, but for a variety of reasons, it will never be possible to express all observations quantitatively. Throughout this report, the terms "severe, moderate, light, and trace" are used to describe the level of defoliation and, in some cases, other injury or insect population levels. Unless otherwise stated, the terms have the following ranges:

Trace	up to 5%
Light	6 - 29%
Moderate	30 - 69%
Severe	70 - 100%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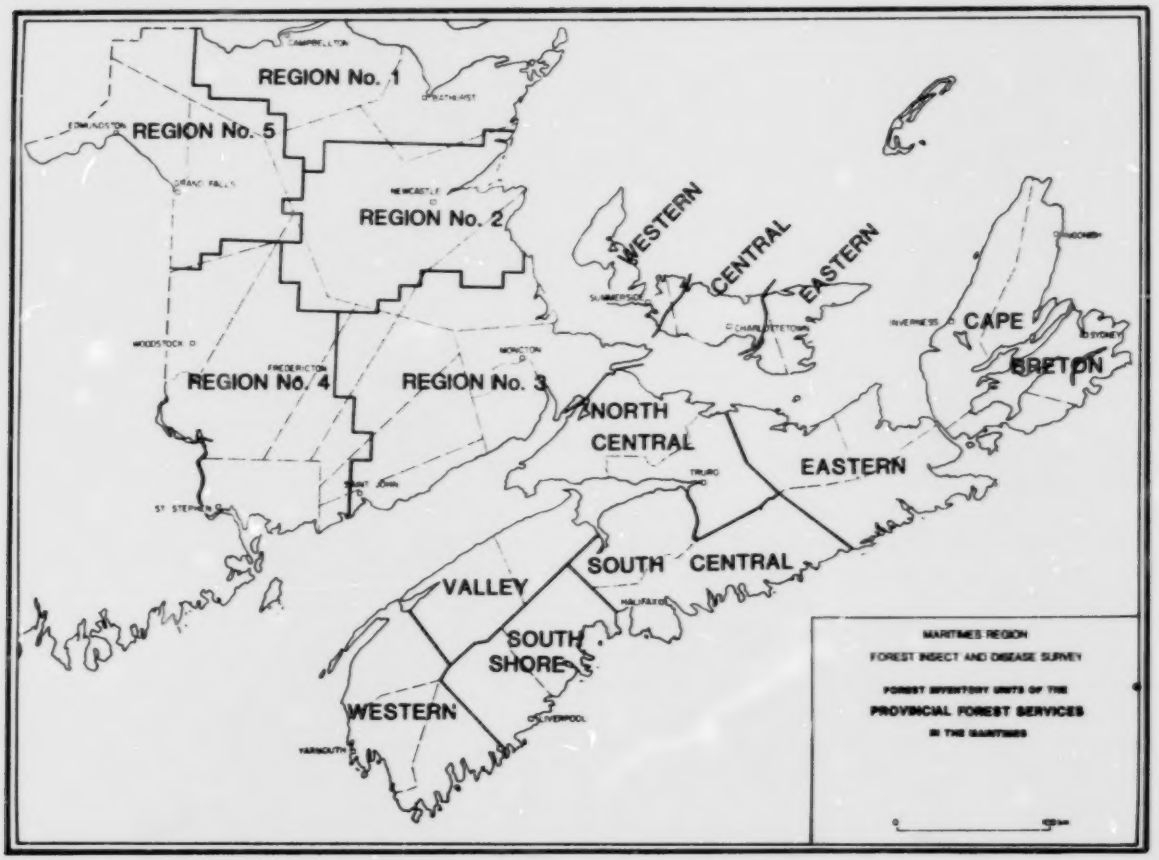
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FOREST INSECT AND DISEASE SURVEY
FOREST INVENTORY UNITS OF THE
PROVINCIAL FOREST SERVICES
IN THE MARITIMES

IMPORTANT AND CONSPICUOUS

FOREST PESTS

SPRUCE BUDWORM

Information presented on the spruce budworm, Choristoneura fumiferana (Clem.) is summarized from various sources: New Brunswick Department of Natural Resources, Forest Protection Limited, J.D. Irving Limited, Nova Scotia Department of Lands and Forests, Prince Edward Island Department of Energy and Forestry, and the Maritimes Forest Research Centre. Both published and unpublished data were used with permission, and the cooperation of all organizations is acknowledged. Special thanks go to Mr. E.G. Kettela for most of the 1983 defoliation story. More detailed information is available from the various sources.

NEW BRUNSWICK

Defoliation of balsam fir and spruce stands occurred over an estimated 2 329 000 ha in the Province in 1983. Defoliation was severe on 1 673 000 ha, moderate on 355 000 ha, and light on 301 000 ha. Extensive areas of severe and moderate defoliation were detected throughout New Brunswick (Fig. 1).

Both the area affected and the level of defoliation increased dramatically from 1982. The total area of defoliation in 1983 was more than 60% larger than the 1 387 000 ha affected the previous year, and severe defoliation alone surpassed the 1982 total for all classes of defoliation. Further, the 1983 severe defoliation was more than double that of the 811 000 ha so affected in 1982.

Damage An estimated 2.2 million m^3 of balsam fir and 1.7 million m^3 of spruce died in New Brunswick as a result of repeated defoliation by the spruce budworm. The loss occurred over the nearly 5.8 million ha of forest land with measurable softwood component. Damage estimates were supplied by the New Brunswick Department of Natural Resources, as part of a comprehensive revision of their approximately 1100 forest inventory plots during 1983.

Control operations Foliage protection against the spruce budworm in New Brunswick was conducted over 1 741 000 ha in 1983 by Forest Protection Ltd. Fredericton, and Forest Patrol Ltd., a subsidiary Company of J.D. Irving Ltd. Saint John, N.B. In the industrial forest zone, Forest Protection Ltd. treated 1 312 000 ha with the chemical fenitrothion at a dosage of 210 g/ha per application and 101 000 ha with the chemical Matacil® 180F at a dosage of 70 g/ha per application. In addition, Forest Protection Ltd., treated 82 000 ha of private woodlots; 71 700 ha with fenitrothion and 10 300 ha with Novabac-3® (a preparation of Bacillus thuringiensis) at a dosage of 30 BIU/ha. All except about 700 ha treated with chemicals received two applications but there was one application of Novabec-3®.

Forest Patrol Ltd. treated 246 000 ha; about 242 000 ha with fenitrothion at a dosage of 210 g/ha per application and almost 4 000 ha with Orthene® (acephate) at a dosage of 275 g/ha per application for control of spruce budworm and spruce bud moth.

Forecast Egg-mass surveys were conducted at 1316 points in the Province in 1983. Population levels of spruce budworm are expected to be high or very high at 32%, moderate at 20%, and low at 48% of the locations sampled. The 52% of sample points in moderate to very high categories represent a substantial reduction from the 74% in these categories in 1982. The results indicate that moderate to severe infestations will occur in about two-thirds of New Brunswick in 1984, somewhat smaller than in 1983, and although defoliation will be evident throughout, much of the reduction will be in the southern part of the Province.

NOVA SCOTIA

Defoliation of balsam fir and spruce in softwood and mixedwood stands occurred on 357 600 ha in Nova Scotia (Fig. 1). Defoliation was severe on 242 200 ha, moderate on 52 000 ha, and light on 63 400 ha. The 294 200 ha of moderate and severe defoliation is a substantial increase over the 174 900 ha so affected in the Province in 1982. Although in 1983 spruce budworm infestations existed at some level in a more or less continuous band along the northern shores of the Province, the previously identified outbreak areas are discussed briefly to provide for historical continuity in reporting.

In Colchester-Cumberland counties the area of severe and moderate defoliation increased to 177 500 ha in 1983 from 140 900 ha in 1982 and 100 800 ha in 1981. In 1983, severe defoliation occurred on 158 600 ha, more than triple the 48 900 ha recorded the previous year.

On the Northumberland Strait coast area of Pictou and Antigonish counties defoliation was severe or moderate on 54 700 ha; much increased from 29 500 ha recorded in 1982 and 12 600 ha in 1981. While in 1982 most of the defoliation (97%) in these categories was moderate, this year in more than two-thirds (38 200 ha) of the area, defoliation was recorded as severe.

In the Annapolis Valley-Hants County area, where only moderate defoliation occurred on 4100 ha in 1982, defoliation was severe on 29 900, moderate on 14 100, and light on 34 700 ha, in 1983. The total, 78 700 ha, defoliation is still considerably less, however, than the 136 200 ha affected in 1981.

On Cape Breton Island the following areas were recorded in the various categories of defoliation for 1983, with 1982 figures in parenthesis: severe 15 500 ha (0 ha), moderate 2200 ha (400 ha), light 500 ha (12 300 ha). However, in many of these areas tree mortality previously was in excess of 75% and defoliation occurred on the residual surviving trees, mostly on white spruce and occasionally on black spruce, as confirmed by ground checks.

Damage An estimated 1.4 million m^3 balsam fir and 0.5 million m^3 spruce died in Nova Scotia in 1983 as a result of repeated defoliation by spruce budworm and attacks on spruce by the spruce beetle. The estimates were based on a damage assessment survey conducted by the Forest Insect and Disease Survey.

Mortality of merchantable balsam fir has been followed on permanent research plots on both the Highland and Lowland areas of Cape Breton Island since 1976. Although spruce budworm populations have decreased drastically from those at the height of the outbreak, losses continued to mount with many of the weakened trees falling victim to a complex of secondary organisms. On the Highlands, 76.9% of the original trees had been lost by the fall of 1983, 65.9% to mortality and 11.0% to blowdown. The increase in total losses from 1982 was 5.3%. On the Lowlands, where losses were much lower at the beginning of the outbreak, mortality has accelerated during the past few years and by the fall of 1983 had reached 84.6%. Mortality and the 5.8% blowdown now amounts to 90.4% of the trees lost on the research plots.

Control operations against the spruce budworm were conducted by Nova Scotia Department of Lands and Forests and were designed for protection of high value spruce and balsam fir stands. On the mainland, 20 240 ha were treated in 11 areas in Cumberland and Colchester counties, while 487 ha, consisting of four seed production areas and one silviculturally improved stand, received treatment on Cape Breton Island. Commercial and experimental preparations of the biocide Bacillus thuringiensis (Dipel 88®, Thuricide 32LV®, Novabec-3®, and Futura®) were used at a dosage of 20 BIU/ha.

Forecast Egg-mass surveys indicate a dramatic downturn in spruce budworm infestations except in Kings County but, although less defoliation than in 1983 is expected to occur in 1984, "the budworm has not gone away." Moderate to severe defoliation is likely in areas of Antigonish, Pictou, Cumberland, Kings and Annapolis counties.

PRINCE EDWARD ISLAND

Defoliation of balsam fir and spruce stands occurred on 43 400 ha in Prince Edward Island in 1983, more than double the 15 300 ha affected in 1982. Defoliation was severe on 8500 ha, moderate on 13 700 ha, and light on 21 200 ha, and was widespread throughout the Province (Fig. 1). The increase in spruce budworm defoliation was higher than forecasted, based on 1982 egg-mass surveys which demonstrates that predicting biological events many months in advance is sometimes difficult. When the organisms involved, such as insects and trees, are complex and their activities and interactions are strongly influenced by factors such as weather, forecasts at times are not accurate.

Damage an estimated 60 000 m^3 balsam fir and 80 000 m^3 spruce died in Prince Edward Island in 1983 as a result of repeated defoliation by the spruce budworm and attacks on spruce by the spruce beetle. The estimates were based on a special damage assessment survey conducted by the Forest Insect and Disease Survey.

Control No control measures on an operational scale were carried out against the spruce budworm in Prince Edward Island.

Forecast Egg-mass surveys indicate a continuation of the infestation in 1984. Moderate and severe defoliation is expected in many areas throughout, with spruce budworm populations highest in the western part of the Province.

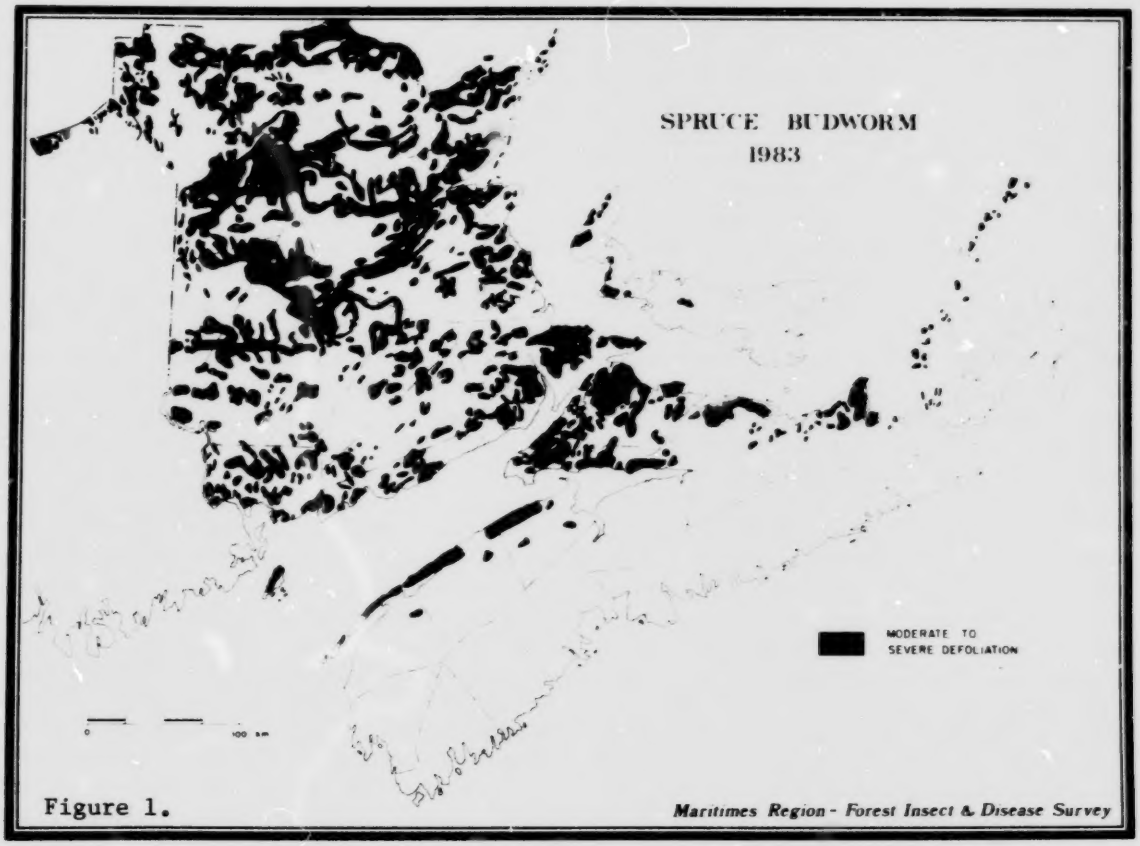

Figure 1.

SPRUCE BUD MOTH

Spruce Bud Moth, Zeiraphera canadensis Mutuura & Freeman, (and to a much lesser extent Zeiraphera destitutana (Walker)) has been an omnipresent forest pest in the Maritimes for as long as Forest Insect and Disease Survey records have been kept, since late 1930s. Although widespread, insect populations have been generally low except for the occasional "flareup" usually on open-grown white spruce. The last recorded outbreak occurred in New Brunswick in the mid-1960s when spruce in parts of the Southwest Miramichi and the Nashwaak River drainage systems sustained moderate to severe defoliation, and in Nova Scotia in the mid-1970s when similar levels of defoliation occurred in areas along the Northumberland Strait and the Fundy Coast.

Spruce bud moth, a not-too-important forest insect in mature forests, became a major pest when, in 1980, it was discovered to be causing defoliation, shoot distortion, and tree deformation in white spruce plantations over large areas in New Brunswick. In 1982, over two-thirds of the 180 locations surveyed in the Region were infested by spruce bud moth. At over 40% of these, in both New Brunswick and Prince Edward Island, defoliation and shoot damage were in excess of 10% and were classed as moderate or severe at 10 and 20% of the locations, respectively, in those provinces.

In 1983, spruce bud moth was again widespread in New Brunswick and in Prince Edward Island but only sporadic in Nova Scotia. Populations were high and defoliation of white spruce considerable over large areas in northern New Brunswick in the spring. At the same time, in some of these areas, defoliation on balsam fir was minimal. As the season progressed and feeding by the spruce budworm increased on both spruce and balsam fir the initial difference in defoliation levels on the two hosts became less obvious. Also, spruce bud moth feeding was more difficult to detect on white spruce. By the end of the combined feeding period the spruce budworm had "out-fed" and masked the damage caused by the spruce bud moth in many areas, as witnessed by the abundance of the spruce budworm pupal cases in stands where spruce bud moth was the initial defoliator.

The area affected by spruce bud moth in 1983 has not been determined. During spruce budworm defoliation surveys 94 000 ha were mapped where detectable foliage discoloration occurred on white spruce without visible defoliation on the balsam fir component. This was likely caused by the spruce bud moth. However, the total area affected was not restricted to this figure.

The presence of small numbers of the Spruce Coneworm, Dioryctria reniculelloides Mut. & Mun. in samples collected in 1983, is an indication that another insect could be joining the pest complex of white spruce in the near future.

BARK BEETLES OF CONIFERS

Not as conspicuous as some other defoliators, bark beetles nonetheless are an important group of forest insects causing tree mortality. Bark beetles usually attack trees that have been weakened by other factors but when populations are at outbreak levels, healthy trees are successfully attacked and may be killed. In addition to the discussion in this chapter on the two major species, the reader is directed to the sections on "Plantation Survey of Red Pine" and "Damage Assessment in Fir-Spruce Stands" for further information on some so-called "secondary" beetles.

Spruce Beetle, Dendroctonus rufipennis (Kby.) attacks continued throughout the Region in 1983. Mortality of white spruce intensified. The increased mortality was particularly obvious on Cape Breton Island in Nova Scotia and parts of Queens County in Prince Edward Island. The insect was found in an additional area in New Brunswick.

In Nova Scotia, the center of the outbreak has shifted west on Cape Breton Island. In some areas of the Margaree Valley to Lake Ainsle and of the Mabou

River valley, an estimated 50% of the white spruce trees was killed in 1983. Considerable mortality also occurred in areas of Victoria County especially near Baddeck and North River Bridge. The shift in the outbreak means that no substantial areas remain on Cape Breton Island without severe white spruce mortality. Combined aerial and ground surveys estimated white spruce mortality at 22% in Inverness, 17% in Victoria, and 14% in Cape Breton County, in 1983. Including the 1983 losses, an estimated 37% of the merchantable white spruce volume has died since the beginning of the current spruce beetle outbreak on Cape Breton Island. On the mainland, white spruce mortality occurred in pockets throughout but was most common in Digby County.

In Prince Edward Island, there was a marked increase in 1983 in the number of recently killed, red trees in numerous areas, mainly in Queens County. There were no surveys on which to base an estimate of timber loss in 1983. However, an estimated 30% of the merchantable spruce has been killed by the spruce beetle from the beginning of the current outbreak to the end of 1982.

In New Brunswick, the outbreak continued on Grand Manan Island and more mature white spruce trees, 50-60 cm in diameter, were killed. Further tree mortality occurred in Westmorland County, in one area near Aulac 12 of 20 trees examined (60%) were killed in 1983. The infestation remained active in Fundy National Park, Albert County.

Eastern Larch Beetle, Dendroctonus simplex LeC., normally attacks only weakened, damaged, or recently felled host material. However, when populations are very high, living, apparently healthy, mature or overmature trees, and even younger small diameter trees can also become infested.

In the Maritimes, a population build-up was first noticed in Nova Scotia in 1976. This increase in beetle populations followed several years of severe defoliation of larch by the larch sawfly, Pristiphora erichsonii (Htg.). Since then, the beetle has become widespread in all three provinces and has caused serious tree mortality. By the end of 1981, when the last detailed survey for this insect was conducted, an estimated 24% of merchantable-size larch was dead in New Brunswick, 64% in Nova Scotia, and 13% in Prince Edward Island.

In 1983, dying trees were commonly observed throughout the Region and infestations appeared to have increased somewhat from those in 1982. These observations were supported by data obtained from a research plot in central New Brunswick where a further 2.9% of the trees became infested and 2.9% of the trees died during the past year.

CANKERS OF CONIFERS

Cankers are caused by a great number of fungi, the attacks of which are manifested in different ways. However, all are similar in one important aspect: they damage trees. Damage varies from the loss of a few small branches or minor stem infections to the deformation of the stem to such an extent that it becomes of little or no value, or the tree may die. Damage in stands is also variable. Some canker diseases eliminate but a few trees, while others may spread and infect most or all trees in a stand or plantation. Losses are both direct, such as reduction in wood value, and indirect, such as low quality trees occupying valuable space or affected trees serving as sources of infection either to other trees in the same stand or to areas nearby.

European Larch Canker, caused by the fungus Lachnellula willkommii (Hartig) Dennis, was first discovered in the Maritimes in 1980. Surveys since then established the distribution of the disease as widespread in southeastern New Brunswick and on mainland Nova Scotia. (Fig. 2). European larch canker has been a serious disease in many parts of Europe. The fungus is considered, by most, to be a primary pathogen (capable of infecting vigorous, healthy trees) and its presence in Europe has resulted in the exclusion of larch from plantation programs. In North America, the fungus was found in Massachusetts in the 1920s in European larch plantations.

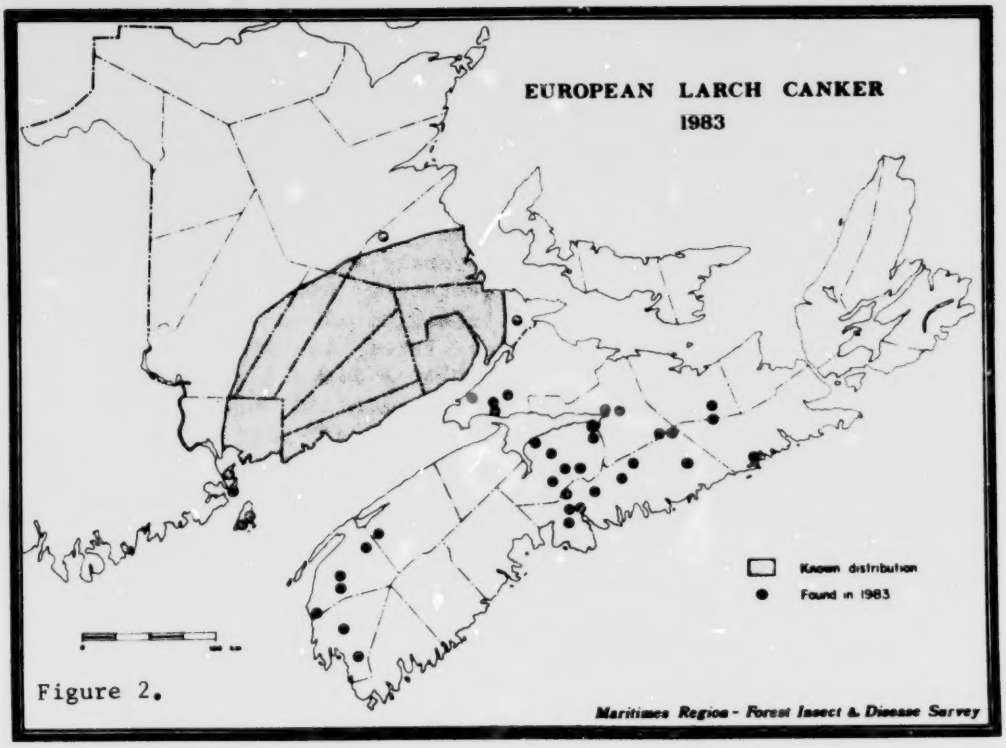

Figure 2.

Periodic concentrated eradication attempts appear to have been successful as the disease was not found during surveys of the area in 1965. However, it was found in northeastern Maine in 1981.

The fungus infects mostly young trees, therefore, future wood supplies may be affected. Tree mortality reduces stocking, branch mortality reduces growth, and cankers reduce wood quality. The extent to which the disease will cause damage in the Maritimes is not yet known but the potential for damage is there and the role of the disease will have to be considered in view of increased emphasis on forest renewal and larch tree improvement programs.

Investigation of several aspects of the behavior of the fungus under our climatic conditions has been initiated. Results will be reported as they become available. A survey to establish how the disease may have been introduced indicates that the fungus could have been present in the Maritimes for about two decades before its discovery and may have spread from specific points to other areas. The disease is capable of intensifying rapidly in young stands. The incidence of infected trees in a research plot increased from 7 to almost 19% between the autumn of 1982 and 1983. A closely related fungus, Lachnellula occidentalis (Hahn & Ayers) Dharne, is present occasionally on small dead twigs without cankers.

Scleroderris Canker, caused by the fungus Gremmeniella abietina (Lagerb.) Morelet, was first found in the Maritimes Region in 1971. The disease is widespread in New Brunswick, especially in the northern half of the Province and infects mostly plantations of jack, red, and Scots pine. In Nova Scotia, where the disease was first found in 1972, a few plantations of red, jack, and Scots pine suffered limited lower branch mortality during the mid-1970s. The disease was last found in that Province in 1978, and appears to have died out. It has never been found in Prince Edward Island.

The European race of the disease, which is capable of killing trees of any size (the North American race kills only small trees), and several other "intermediate" races have been found in New Brunswick since 1978; however, symptoms and damage expression are indistinguishable. Plantations infected by these races have either been removed or are under close surveillance for changes in symptom expression.

In 1983, the disease was observed in several areas in New Brunswick but, as in the past three years, few new infections occurred. Weather conditions during the spring infection period - wet and cool— were nearly ideal for the fungus and an upsurge in branch mortality can be expected in 1984, following the necessary one-year "hidden" period, after infection, but before symptoms appear.

SIROCOCCUS SHOOT BLIGHT

Sirococcus Shoot Blight, caused by the fungus Sirococcus strobilinus Preuss, has been known in the Maritimes for only about a decade but has been present for much longer. The fungus infects and kills newly developed shoots. It produces fruiting bodies on the twigs, needles, and cone scales from whence the spores are dispersed and cause new infection. Heavy attacks cause branch mortality, which results in crown dieback and tree mortality. Although in the Maritimes the disease affects mostly red pine and occasionally spruce, other species of pine, larch, hemlock, Douglas fir, and true firs can also be affected. Trees of any size, from seedlings to mature trees 15 m in height, are damaged or killed.

The disease is present in all three provinces but is most widely distributed in red pine plantations in Nova Scotia. The damage potential of the disease, indicated by observations reported in 1982, prompted a special assessment survey of plantations and natural stands of red pine in 1983. This assessment was conducted in addition to other regular surveys which in 1983 included a forest pest assessment in young red pine plantations. The results are summarized in Table 1.

In New Brunswick, infection was found only in the south and central parts of the Province during both the assessment and the general surveys. Although young plantations were not found infected, in some areas natural regeneration was severely affected, especially when older overstory trees harbored the fungus. Infection on ornamental red pine trees persisted in several areas at Fundy National Park.

In mainland Nova Scotia, the hardest hit area in the Region, all affected areas were found west of the Colchester-Pictou and Halifax-Guysborough county lines in 1983, although the disease is known to occur throughout the Province, including Cape Breton Island. Ornamental trees and hedgerows were affected in several areas and the disease was present in one of the young plantations assessed in Hants County.

In Prince Edward Island, light shoot damage occurred in the only infected plantation (about 1 ha) found in the Province at Iona, Queens County.

Symptoms of infection by S. strobilinus, expressed as needle discoloration or shedding, shoot stunting, or mortality, appeared increasingly more severe towards the lower portion of tree crowns regardless of the height of affected trees. This was shown when disease incidence on trees was expressed in terms of crown position within tree-height classes and was even more pronounced when the proportion of infected shoots at different crown levels was tabulated (Table 2).

The increase in severity of infection towards the bottom portion of the crown is likely a result of the rain-splash spread of spores of the fungus. The shorter the plantation trees, the greater was the proportion of infected branches at any given crown level. This indicates that conditions for infection are more favorable towards ground level where humidity is generally higher, influenced partly by crown closure.

Table 1. Summary of survey for Sirococcus shoot blight in the Maritimes in 1983

Description	New Brunswick	Nova Scotia	Prince Edward Island
Stands[1]			
- assessed	29	46	2
- average height (m)	10.2	9.5	11.7
- range (m)	2-18	3-17	----
Infection			
- stands infected (%)	14	37	50
- frequency of infected trees in affected stands (%)	46.2	76.4	23
- range (%)	5-76	16-100	----
- overall infection rate of trees assessed (%)	6.4	28.2	12.5
Tree mortality			
- frequency in all assessed stands (%)	0	8.6	0
- frequency in affected stands (%)	0	23.5	0
- incidence in affected stands (%)	0	9-30	0

[1]Stand = mostly plantations but not excluding natural stands.

Tree mortality is an outright loss especially in plantations, where already-expended investments of time and funds are lost. The true significance of Sirococcus shoot blight, however, may be that infected trees, through the persistence of the fungus, sustain repeated damage which results in branch mortality, crown dieback, deformity, and the subsequent loss of wood production.

Table 2. Sirococcus shoot blight - the effects of tree height and of crown position on infected levels in the Maritimes - 1983

Tree height (m)	Crown position	Trees with infection (%)	Infected shoots (%)
0 - 4.9	Top 1/4	20	9.0
	Upper Middle	27	31.0
	Lower Middle	27	54.0
	Bottom 1/4	27	59.0
5.0 - 9.9	Top 1/4	17	4.8
	Upper Middle	17	8.8
	Lower Middle	25	17.9
	Bottom 1/4	42	42.9
10.0 -14.9	Top 1/4	15	2.7
	Upper Middle	19	8.0
	Lower Middle	33	17.8
	Bottom 1/4	33	29.3

ARMILLARIA ROOT ROT

Armillaria Root Rot, Armillaria mellea (Vahl ex Fr.) Kummer, a disease of a wide variety of tree species of various ages has always been a part of the forest disease complex in the Maritimes but its significance appears to have changed in recent years. On the one hand, the fungus is strongly implicated among the group of secondary organisms that combine to provide the final blow to trees weakened by other factors such as repeated defoliation by the spruce budworm. On the other hand, Armillaria infected or killed trees are becoming more frequent throughout the Maritimes. The increased frequency is doubtless a factor of the increase in the areas planted: the implications under our climate are poorly understood. However, the disease is killing trees in plantations. In some areas, groups of trees are affected and there is evidence that with the spread of the fungus these patches could increase in size. In other areas, only scattered trees are infected but these could become centers of patches if the fungus spreads. Not all infected trees die, the fungus primarily is a wood decay organism causing root and butt rot, but its action may cause understocking in both plantations and natural stands.

In 1983, the fungus killed trees in plantations of black spruce, red spruce, jack pine, and red pine in New Brunswick and balsam fir Christmas trees in several areas in Nova Scotia. In a 5-year-old black spruce plantation, 12% of the trees were either dead or dying from infection. Plots to study the spread of the disease in black spruce under different conditions have been established and similar studies will be initiated in stands of other species when suitable sites become available.

JACK PINE BUDWORM

Jack Pine Budworm, Choristoneura pinus pinus Free., populations have been increasing in New Brunswick, especially in the eastern half of the Province where most of the natural jack pine stands are located. Jack pine budworm feeds on male flowers and on new foliage of jack pine and occasionally on Scots, red, and white pine trees. The insect affects mostly the upper portion of the crown which can result in deformed trees because of top kill and the subsequent formation of multiple leaders. Repeated heavy defoliation may kill the tree. Although the insect at high populations is considered important in natural stands, its economic impact is likely to be even greater in plantations.

In 1983, foliage browning, the result of feeding, was readily visible from the air within an area of about 200 000 ha in the east-central part of New Brunswick wherever jack pine occurred. This area contains about 35 000 ha where jack pine is a significant species. (Fig. 3). Damage intensity was variable within the affected area but at randomly selected locations, 61% of the shoots lost more than half of their needles and only 20% of the shoots were unaffected by defoliation. Larvae were observed at a few other locations in the Province, especially in the Tracadie area. Both parasites and disease are present in the jack pine budworm population but at such low levels that neither is likely to be of any importance in the near future as an effective biological control.

GYPSY MOTH

After its reappearance in the Maritimes in 1981, the gypsy moth, Lymantria dispar (L.), gained further ground in 1983 and is now at least temporarily established in both New Brunswick and Nova Scotia.

Gypsy moth has been the most destructive insect of hardwoods and to a lesser degree of conifers for decades in the northeastern United States. The expansion of the outbreak in Maine in the last few years has been a special concern to us because of its proximity to our Region.

The gypsy moth monitoring committee remained active in 1983 and again coordinated all surveys. This committee was formed in response to the discovery of

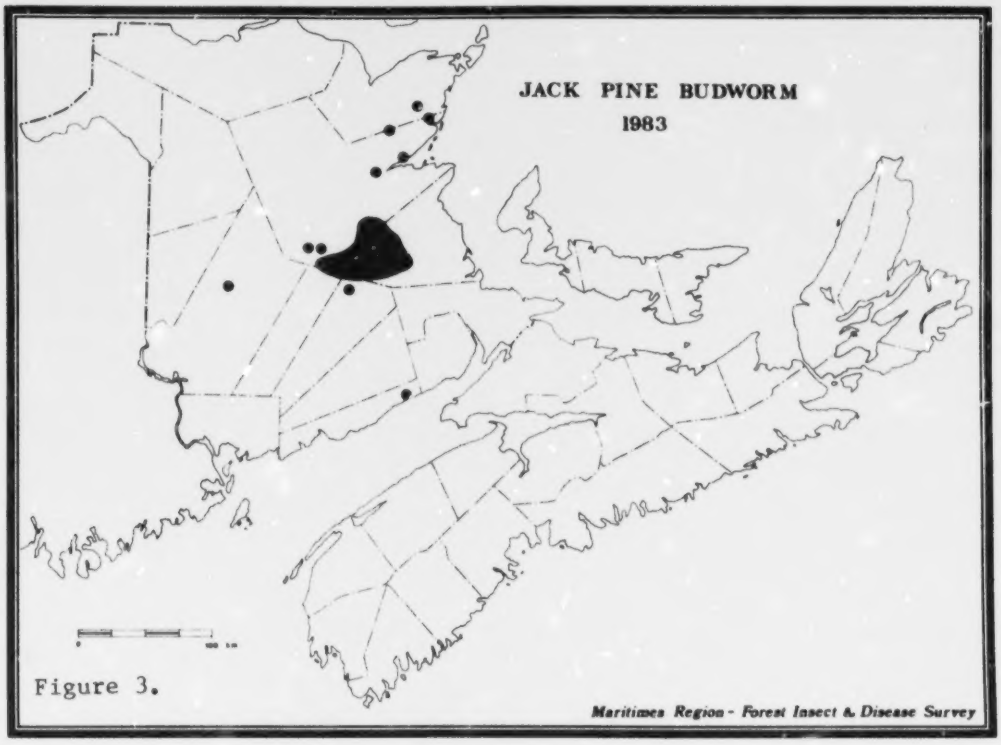

Figure 3.

gypsy moth in 1981, in an effort to utilize available manpower more efficiently in combating this latest threat to the forests of the Region. Organizations involved in surveys include the Forest Insect and Disease Survey of the Canadian Forestry Service and Parks Canada of the federal Department of Environment, the Plant Health and Inspection Branch of Agriculture Canada, New Brunswick Department of Natural Resources, New Brunswick Department of Agriculture, Nova Scotia Department of Lands and Forests, Nova Scotia Department of Agriculture, and Prince Edward Island Department of Energy and Forestry. In addition, hundreds of volunteers, campground operators, small woodlot owners, biology teachers, students, and other interested private citizens assisted in the most extensive pheromone trapping program ever conducted in the Maritimes. The New Brunswick Department of Environment was involved in discussions on control. In 1983, larval surveys and egg-mass surveys were conducted in the Region with the following results.

In New Brunwick, larvae, pupae, or fresh egg masses were found in Charlotte County at the following locations: Mohannes, northwest of Oak Hill along the Canoose Road, Oak Hill, Upper Mills, St. Stephen on the Ledge Road, St. David Ridge just north of Oak Bay, St. Andrews, St. George, and Beaver Harbour. The highest populations existed in St. Andrews where numerous larvae and pupae were collected and consequently egg masses were found on shade trees in several areas of the Town. In York County, more than 20 egg masses were found in a multiblock area of Fredericton, during a preliminary survey involving only street trees.

In Nova Scotia, larvae, pupae, or fresh egg masses were found in Yarmouth County at Yarmouth and Tusket; in Digby County at Grosses Coques and Digby; in Annapolis County at Paradise and in Kejimkujik National Park; in Kings County at New Minas; in Halifax County

at Halifax; in Shelburne County at Shelburne. The Town of Shelburne, where 46 new egg masses were found during surveys, appears to have the highest level of infestation in Nova Scotia.

Adult male trapping is aimed at defining areas where searching for egg masses should be concentrated. As a result of studies since 1980, the trap placement design was changed to eliminate, or at least to minimize, interference from large numbers of male moths (females are flightless) brought into the Region by weather fronts from infested areas in the United States. In 1983, over 4200 pheromone traps were used in the Maritimes, over 1000 in New Brunswick, almost 3000 in Nova Scotia, and 155 in Prince Edward Island. Information was obtained from only 2562 or 60% of the traps used, for a variety of reasons; the two main ones being vandalism to traps and incomplete understanding of the value of "negative" results by some cooperators. The modified system increased the accuracy of identifying suspect areas.

The results of gypsy moth surveys, other than adult trapping programs, conducted from 1981 to 1983 are summarized in Table 3 and Fig. 4. Gypsy moth appears well entrenched in southwestern New Brunswick and in western Nova Scotia. However, the populations at present, in most places, are so low that the effort required "to chase down individual larvae" during detection surveys taxed the resources available beyond their limits. A different system of monitoring the progression of gypsy moth will likely be used in the future.

Control operations against the gypsy moth were conducted in the Mohannes area of New Brunswick and at Yarmouth in Nova Scotia in 1983. At Mohannes, the New Brunswick Department of Natural Resources coordinated a suppression program with Agriculture Canada, the Canadian

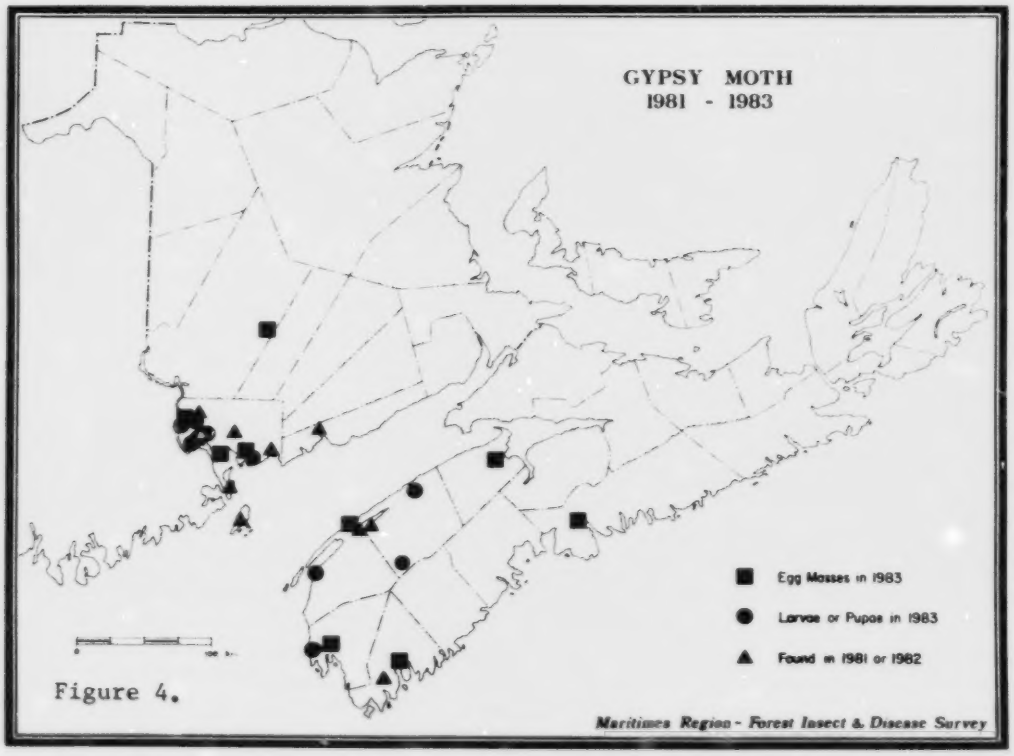
GYPSY MOTH
1981 - 1983
Egg Masses in 1983
Larvae or Pupae in 1983
Found in 1981 or 1982
Maritimes Region - Forest Insect & Disease Survey

Figure 4.

Table 3. Summary of the results of detection surveys for gypsy moth in the Maritimes Region, 1981 - 1983

Province	County	Location	U.T.M. Grid[1]	Gypsy moth life stages[2] 1981 L	1981 P	1981 E	1982 L	1982 P	1982 E	1983 L	1983 P	1983 E	Remarks
New Brunswick	Charlotte	Mohannes	19-62(7)-500(2)	x			x	x	x	x	x		
		N.W. of Oak Hill (Canoose Rd)	19-62(9)-502(3)									x	
		Oak Hill	19-63(1)-502(2)				x			x			
		Upper Mills	19-63(2)-500(0)							x			
		Lynnfield	19-63(3)-502(7)				x						Cast skin
		St. Stephen	19-63(7)-500(4)						x	x			Found in 1983
		Oak Bay-St. David Ridge	19-64(0)-501(1)							x			
		St. Andrews	19-65(4)-499(3)							x	x	x	
		Didgequash	19-66(2)-500(2)				x						
		St. George	19-67(2)-499(9)					x		x	x	x	2 moths in 1983
		Beaver Harbour	19-67(7)-499(4)	x						x			
		Pennfield	19-68(9)-499(4)	x									
		Campobello Island	19-66(0)-497(2)					x					
		Grand Manan Island	19-67(3)-494(9)	x									
	St. John	Saint John	19-72(9)-501(5)					x					
	York	Fredericton	19-68(3)-509(3)						x			x	Found in 1983
Nova Scotia	Yarmouth	Yarmouth	20-24(9)-485(8)	x					x		x		
		Tusket	20-26(2)-486(0)									x	
	Digby	Grosses Coques	20-25(3)-491(6)					x	x	x			
		Digby	20-28(2)-494(4)									x	
		Smiths Cove	20-28(4)-494(3)					x	x				
	Annapolis	Clementsport	20-29(4)-494(8)					x	x				
		Paradise	20-32(6)-497(2)						x	x			
		Kejimkujik Nat. Park	20-31(9)-492(5)							x	x		
	Kings	New Minas	20-38(6)-499(2)							x	x	x	
	Halifax	Halifax	20-45(5)-494(3)							x		x	
	Shelburne	Shelburne	20-31(4)-484(8)						x			x	Found in 1983
		Clyde River	20-30(0)-483(4)						x				Found in 1983

[1]U.T.M. = Universal Transverse Mercator system.
[2]L = larva; P = pupa; E = egg mass.

Forestry Service, and Georgia-Pacific Limited, the owner of the land. Approximately 18 ha of red oak were clear-cut and 182 ha were treated with the biocide Bacillus thuringiensis (Dipel 88®) in three aerial applications, for a total dosage of 100 BIU/ha (30-30-40).

About 5800 egg parasites (Anastatus disparis Ruschka) were released at the end of August to coincide with egg laying activities of the gypsy moth. Because no new egg masses were found in 1983 no evaluation of the program was possible.

In Nova Scotia, the Town of Yarmouth in cooperation with the Department of Lands and Forests, treated ornamental street trees over several blocks with one application of Bacillus thuringiensis at a dosage of 20 BIU/ha from the ground in the areas where more than 50 egg masses were found in the fall of 1982.

FOREST TENT CATERPILLAR

The Forest Tent Caterpillar, Malacosoma disstria Hbn., was once again the major defoliator of hardwoods in the Maritimes. In 1983, the outbreak areas expanded in Prince Edward Island and Nova Scotia and remained almost as extensive as in 1982 in New Brunswick.

The insect feeds on a wide variety of hardwood trees with preference for trembling aspen, oak, apple, birch, and cherry. When populations are high and larvae migrate in search of food, other tree species such as maple, ash, alder, elm, and ground vegetation are also readily defoliated. Feeding also occurs on some conifers, notably larch and white spruce.

In New Brunswick, severe defoliation, mostly of poplars, occurred over 1.2 million ha in 1983, affecting an estimated 42% of the merchantable-sized poplar, or 13 million m^3, in the Province. The area of defoliation was only slightly less than the 1.4 million ha affected a year earlier (Table 4). Most of the defoliation occurred in the southern part of the Province and along the eastern coast into Northumberland County. The crescent shape area of the outbreak shifted further south for the second consecutive year and defoliation north of the St. John River west of Fredericton was in patches of various sizes (Fig. 5). A combination of below freezing temperatures, snow, and persistent wet weather in May caused larval mortality in some areas, while elsewhere the irregular weather conditions resulted in unusual feeding patterns as only portions of affected trees rather than entire crowns were defoliated.

Table 4. Forest tent caterpillar outbreak in New Brunswick (1978 - 1983)

Year	Area of severe/moderate defoliation (ha)
1978	few small patches
1979	37 000
1980	177 000
1981	775 000
1982	1 389 000
1983	1 199 000

In large parts of the Province within the affected areas many trees did not respond to severe defoliation in the usual manner and failed to replace lost foliage with a new crop of leaves. This failure is explained by the theory of "correlated inhibition" according to which, when defoliation occurs past a certain critical period, the removal of leaves no longer triggers the physiological processes necessary for the production of a second crop of leaves. Defoliation in 1983 was later than normal as a result of a weather-related, peculiar, prolonged feeding period. Defoliation and the subsequent production of new leaves for several successive years may have weakened other trees. The result was extended areas of trembling aspen with bare twigs and branches and with generally "thin" foliage. In midsummer the foliage present was affected, both inside and outside the outbreak areas, by a great variety of leaf spots, leaf rusts, the aspen webworm, Tetralopha aplastella (Hlst.), the lesser aspen webworm, Meroptera pravella (Grt.) and other organisms, creating the effect of very early fall discoloration.

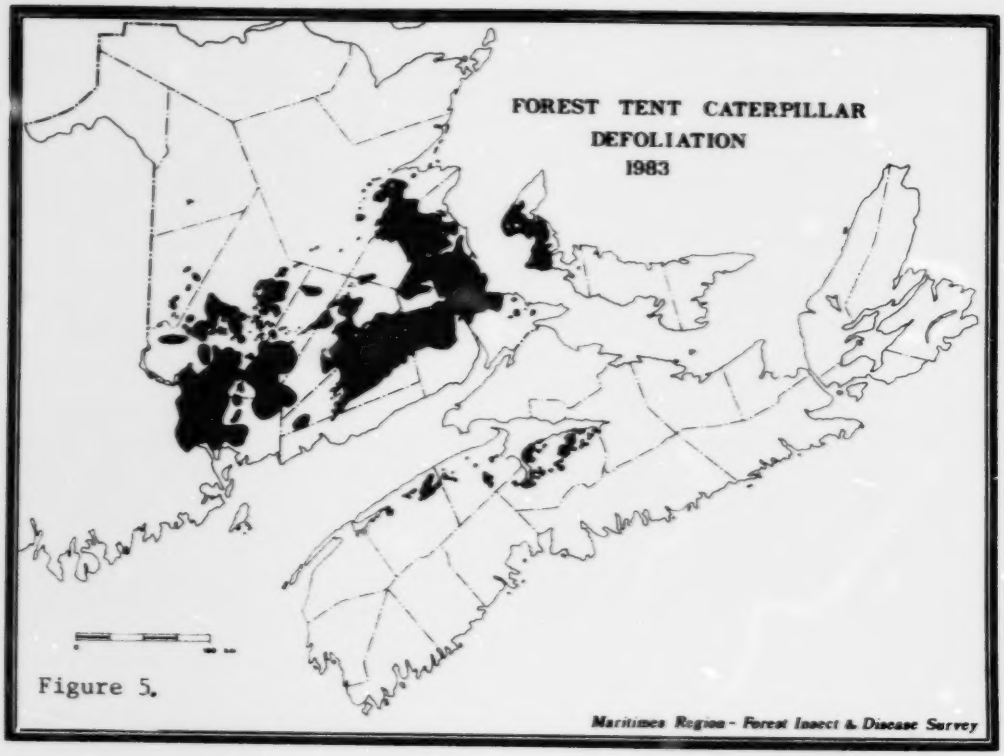

Figure 5.

In Prince Edward Island, the long-standing forest tent caterpillar outbreak in Prince County continued in 1983 and severe defoliation of trembling aspen occurred over 67 000 ha (Fig. 5); more than a three-fold increase from 1982. The poplar in this area represents slightly less than half of the Province's inventory of this species and is about 500 000 m³ of merchantable wood. The insect was also present in low numbers in isolated areas elsewhere in the Province.

The current outbreak became apparent in 1973 when severe defoliation of trembling aspen was observed at eight locations on about 260 ha. The area of defoliation quickly expanded and reached a peak in 1976 when 37 700 ha were affected. A gradual decrease to only 3100 ha of severe and 2000 ha of light defoliation in 1980 was followed by a resurgence in forest tent caterpillar activity. Severe defoliation occurred over 13 500 ha in 1981, 18 800 ha in 1982, and 67 000 in 1983. The condition of trembling aspen trees was similar to that described for New Brunswick, except that twig and branch dieback was more prevalent because of the longer history of the outbreak in this Province.

In Nova Scotia, forest tent caterpillar caused severe defoliation, mostly of trembling aspen, over about 35 000 ha in 1983 (Fig. 5) a significant increase from the 4700 ha affected in 1982, the first year the outbreak reached "measurable size." Most of the defoliation occurred in Annapolis, Kings and northern Hants counties. Although the insect was present in many other parts of Nova Scotia, it occurred mostly in the western part of the Province. It is estimated that defoliation affected about 10% of the Province's poplar inventory or about 1 million m³ of merchantable wood in 1983.

Natural enemies of the forest tent caterpillar include both parasites and diseases. Although these agents caused mortality of more than 50% of late instar larval and pupal populations,

even the combined effect of these biological control agents cannot alone prevent defoliation at current outbreak levels. Pupal mortality, caused by a combination of diseases and parasites, averaged 72% in New Brunswick, 61% in Prince Edward Island, and 52% at the single location assessed in Nova Scotia. The most abundant and effective parasite was the fly Sarcophaga aldrichi Parker, which alone accounted for over 90% of the parasitism at some locations. In many areas of the Region this fly was so abundant that it was more of a nuisance to humans than to the forest tent caterpillar. Its abundance was correlated with the duration of the history of the caterpillar outbreak. The flies were more numerous in areas where the outbreak has persisted and were present in the highest numbers in areas where the forest tent caterpillar population just decreased.

HARDWOOD DEFOLIATORS

In addition to the forest tent caterpillar, which caused widespread defoliation in the Region, and the gypsy moth, which is of special concern because of its recent arrival and potential damage in the Maritimes, many other hardwood insects were active in 1983. Most are included in the table because they occur in localized areas. However a few of the more prevalent species are discussed.

Oak Leaf Shredder, Croesia semipurpurana (Kft.) and the Oak Leafroller, Pseudexentera cressoniana Clem., have been defoliating oak since the early 1970s and have been the most serious pests of oak in the Maritimes. As a result of repeated defoliation, oak trees in many areas are suffering from various degrees of twig, branch, and crown dieback.

In 1983, the two insects again occurred in mixed populations, their ratio varying in different locations. Overall, feeding was somewhat reduced from 1982 although in some specific areas the level of defoliation was higher than in previous years. In western Nova Scotia, the average defoliation was 40% in infested stands, reaching as high as 63% in Kejimkujik National Park. In New Brunswick, defoliation by forest tent caterpillar masked the effects of feeding by the two insects specific to oak in most areas.

Bruce Spanworm, Operophtera bruceata (Hulst) has existed at generally low population levels in the Maritimes since 1976 when the last outbreak collapsed in Nova Scotia. The population increase reported in New Brunswick in 1982 continued in 1983 and the insect was noted in parts of Charlotte, York, Carleton, Victoria, Restigouche, and Madawaska counties. Defoliation occurred on a wide variety of trees including trembling aspen, white birch, yellow birch, sugar maple, red maple, and beech. In some instances, Bruce spanworm occurred together with fall cankerworm. In maple syrup-producing areas in Carleton, Madawaska, and Restigouche counties defoliation ranged from trace to moderate. Light defoliation of apple trees occurred in a few areas in Nova Scotia and the insect was collected from red oak and elm trees in Prince Edward Island, but no defoliation was observed.

Fall Cankerworm, Alsophila pometaria (Harr.) was the most widely reported insect on hardwood insect in the Region in 1983 and was observed in all areas of the Maritimes except Cape Breton Island. The insect fed on a great variety of trees and caused various degrees of defoliation. In most place, Manitoba maple was the most severely defoliated although in some areas, notably the larger population centers such as Fredericton, Edmundston, Moncton, Halifax, Truro, and Charlottetown, other hardwood species also suffered severe defoliation. Fall cankerworm was often associated with the Bruce spanworm and forest tent caterpillar in New Brunswick, and the winter moth in Nova Scotia.

Winter Moth, Operophtera brumata (L.). In Nova Scotia, populations increased markedly in 1983 and the resulting defoliation was both more widespread and more pronounced than in previous years. Apple and red oak were most often affected but ash, sugar maple, red maple, and basswood were also defoliated. The increase in populations was most noticeable in Kings and Hants counties. In Prince Edward Island, defoliation of red oak, basswood, and elm occurred in Queens and Kings counties. In the southeastern part of New Brunswick, apple and red oak trees were affected in the Dorchester, Westmorland County area. Winter moth also was found associated with other hardwood defoliating insects.

Orangehumped Mapleworm, Symmerista leucitys Francl. defoliated sugar maple and beech in eastern Colchester and northeastern Halifax counties, east of Newton Mills in Nova Scotia. Defoliation was severe on trees in patches of 2 to 200 ha, over an area of about 1700 ha. In a few other patches in the same general area understory beech was severely defoliated while on the sugar maple stands leaf loss was only trace to moderate.

Disease was present in the population but at very low levels and is not likely to be a significant control factor in 1984. A few larvae were found at several other locations in the Province but no defoliation was noted. The main concern over the Newton Mills outbreak centered around the possible effects of the late summer defoliation on maple syrup production.

DUTCH ELM DISEASE

Dutch Elm Disease, caused by the fungus Ceratocystis ulmi (Buism.) C. Moreau, continued to spread into new areas (Fig. 6) and to intensify within the known range in 1983.

In Nova Scotia, although the spread was not great, diseased trees were found for the first time outside the known range at Annapolis Royal, Annapolis County, Canning, Kings County, and Dartmouth, Halifax County. Within the known range, there was a significant increase in the number of diseased trees in some areas where intensification is being studied. Near Newport, Hants County, where 11% of the trees became infected between 1980 and 1982, there was an increase of 43.3% in the number of new infections in 1983. While in 1982, 9% of the trees became diseased, in 1983, 4.3% of the remaining healthy trees were infected. This sudden increase followed the same pattern found previously in other areas of the Maritimes and indicates that after this initial "jump" in incidence most of the remaining elm trees are likely to become infected within a few years.

In Prince Edward Island, no infected trees were found in 1983. The disease was first found in 1979 in Prince County. This discovery was followed by an immediate, vigorous sanitation cut by the provincial government. No infected trees were found in 1980 or in 1981; one infected tree was discovered in 1982.

In New Brunswick, the only significant change in distribution was the finding of diseased trees at Popple Depot, Northumberland County, in an area separated from the known range of the disease by nonsusceptible tree species.

In Fredericton, N.B., where the progress of Dutch elm disease and the effect of the control program have been monitored since 1961 when the disease was first found in the City, there was a further reduction in the annual loss in 1983. The 80 trees killed by the disease represented 2.4% of the current elm tree population within the Dutch Elm Disease Management Area. This is the third consecutive decrease in the annual loss rate since 1980 when it reached a peak of 7.8%, followed by 5.3% in 1981, and 3.0% in 1982. Losses to date amount to 26.4% of the original urban elm stand.

No systematic survey was conducted by the Forest Insect and Disease Survey in 1983 for elm bark beetles, the carriers of Dutch elm disease, except in Fredericton where populations of the native elm bark beetle, Hylurgopinus rufipes (Eich.) remained low. One adult of the smaller European elm bark beetle,

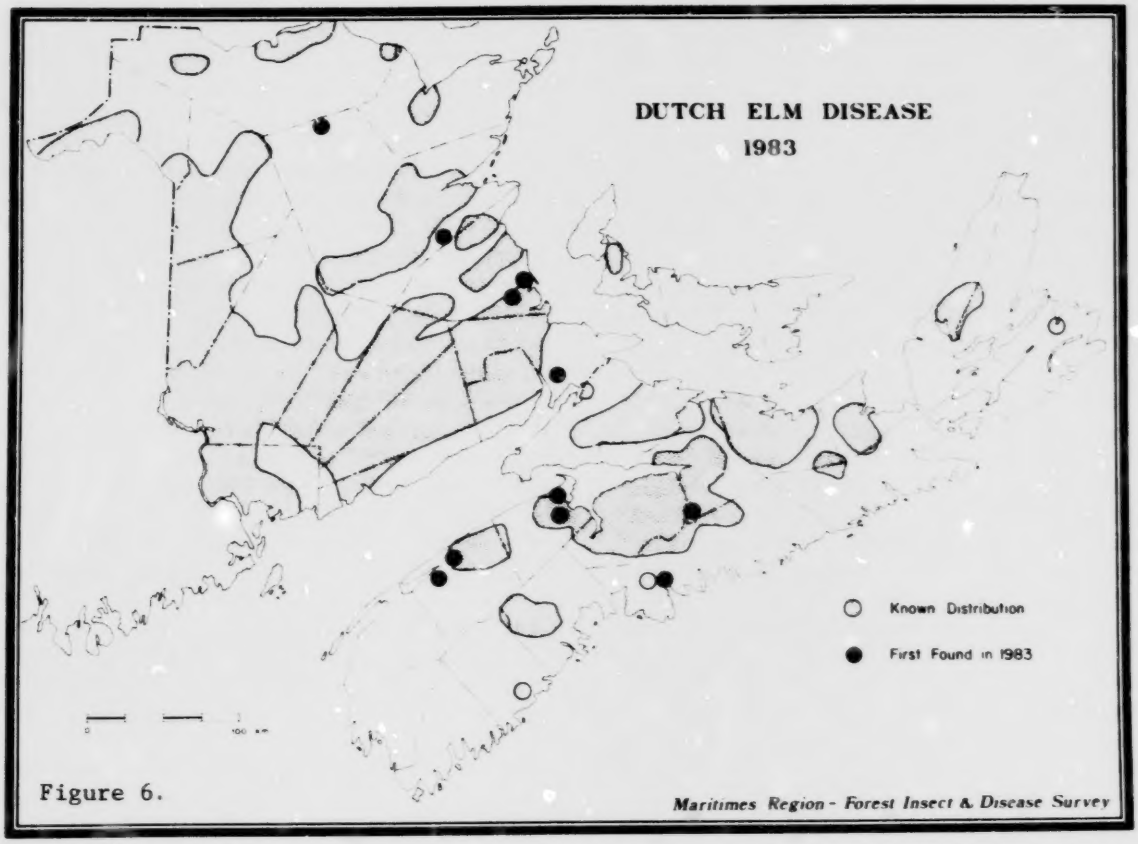

Figure 6.

Scolytus multistriatus (Marsh.) was found in a pheromone trap at Tay Creek, York County (Pers. Comm.[1]).

DETERIORATION OF BIRCH

Early foliage browning and premature leaf drop of white birch occurred between 1979 and 1981 in southern New Brunswick along the Bay of Fundy. In 1982 the severe or moderate leaf discoloration did not materialize and although leaf browning occurred in essentially the same areas its intensity was much lower.

In 1983, severe foliage browning followed by early leaf drop occurred once again along the Bay of Fundy but the most affected areas were farther east than in previous years. The exact cause of the leaf discoloration and the reasons for the deterioration of white birch here and in other areas of the Region are not known.

Air Pollutants were ruled out as the cause of leaf discoloration in either 1982 or 1983. In 1982, systematic sampling was conducted throughout the season in 13 areas to determine changes in the chemical composition of foliage and soil. The results of the analysis of those samples and observations in the affected areas in 1983 indicated that current-year air pollutant injury to white birch, other tree species, or ground flora was absent. "There are no grounds, therefore, to suspect air pollutants as causal agents of the foliar discoloration currently being reported on white birch growing along the Fundy shore" (K. Percy, MFRC, Pers. Comm.). However, several organisms commonly found in the affected areas may each be a factor in the complex that ultimately results in this condition.

The Leaf Spot fungus, Septoria sp. has been the most consistently identified organism since 1979. In 1982,

[1] Dr. L.P.S. Kuenen, Research and Productivity Council, Fredericton, N.B.

it was believed to account for most of the leaf browning sustained by the trees. In 1983, although it was present in most counties in New Brunswick and in a few areas of Nova Scotia, leaf browning was, by far, most common and most pronounced in Charlotte, St. John, and Albert counties along the Bay of Fundy in southern New Brunswick. The intensity of browning was, with the exception of localized areas, below that of 1981 when the condition was most serious.

Bronze Birch Borer, Agrilus anxius Gory, has been active in the area and was implicated in the death of many trees. The insect attacks weakened trees and therefore their numbers do not warrant considering it a primary factor. In 1983, the insect was the ultimate cause of death of trees in several locations both in areas of early leaf browning and elsewhere where trees were in a weakened condition. The most notable observations included an area in southern New Brunswick where a stand of about 25 ha was selectively clear-cut, 8-10 years ago to make a campground. A layer of about 20 cm of sand was added along the lakeshore and around most of the trees. Many of these trees are now dead, top dieback and deterioration are general, and trees attacked or killed by the bronze birch borer are common.

Birch Ambrosia Beetle, Trypodendron betulae Sw. was reported from only two locations in New Brunswick, but judging from its prevalence in parts of neighboring Maine, the insect is probably more common here than observations indicate. Near Mohannes, Charlotte County, about 5% of the white birch trees were attacked by the insect.

Birch Scale, Xylococculus betulae (Perg.) was found infesting an average of 34% of the trees (range 0 to 88%) on 11 plots examined in southern New Brunswick. The insect was also found in numerous areas elsewhere in the Region, the incidence of infested trees ranging from "very low" to 100%.

CHRISTMAS TREE PESTS

Among the many pests of balsam fir Christmas trees, the spruce budworm is by far the most significant in most areas of the Maritimes. Some of the others, usually only of localized importance are mentioned elsewhere in this report. Two insects, however, are discussed here both because of their widespread occurrence and because of their effect on the quality and consequently on the value of Christmas trees. They are discussed not strictly from the point of Christmas tree production, but because their presence in natural stands has a spill-over effect the statements are relevant.

Balsam Gall Midge, Paradiplosis tumifex Gagne, was very widespread in 1983 having been recorded in all counties but one in the three provinces. Infestation levels were extremely variable in both natural stands and Christmas tree areas and damage was moderate and occasionally severe at some locations. The damage and subsequent needle loss resulted in lower than expected grade.

Balsam Twig Aphid, Mindarus abietinus Koch., populations continued on the upward trend that became evident in 1982. Recent peaks in populations occurred in the Maritimes in 1967, 1972, and 1977 and appear as a buildup to another outbreak. Needle and shoot distortion was widespread throughout, and although insect numbers were generally low, damage was noticeable at numerous locations. With the continuation of the upward cycle, infestations could further intensity in 1984 and protection of high-value trees may be necessary.

NURSERY AND GREENHOUSE PROBLEMS

Successful seedling production is essential to avoid or at least to minimize the shortfalls in wood production predicted to occur in the future. Seedling production is as important to plantation programs as seed production is to nurseries. Pests affecting nursery production increase the costs of meeting the objectives of forestry.

Some of the conditions encountered in 1983 in nurseries and greenhouses are mentioned because of their importance and because no facet of forestry operations is without problems. (The following, which is not intended to be all inclusive, was gathered with the cooperation of R.D. Hallett and T.W. Burns, MFRC.)

Insects: Fungus gnats, *Bradysia* sp., were found on black spruce in a greenhouse in Nova Scotia; and juniper scale, *Carulaspis juniperi* (Bouche) on ornamental cedar in Prince Edward Island.

Fungi: Sirococcus shoot blight, *Sirococcus strobilinus* Preuss, caused mortality of red pine in patches in seedbeds in Nova Scotia; needle cast, *Lophodermium pinastri* (Schrad. ex Fr.) Chev., damaged 30-40% of jack pine seedlings in a nursery in Nova Scotia, and infected 10% of red pine seedlings in a 1400 m^2 area in a Prince Edward Island nursery; Douglas fir needle blight *Rhabdocline weirii* Parker & Reed, was present on ornamental stock in Prince Edward Island; grey mold, *Botrytis cinerea* Pers. ex Fr., affected 80% of black spruce seedlings in Prince Edward Island in one operation, and 40% of white spruce in Nova Scotia in another; and smothering fungus, *Thelephora* sp. was present on black spruce in a holding area in Nova Scotia.

Abiotic conditions: Early frost and winter damage, including seedling mortality occurred in improperly hardened-off jack pine, black spruce, red spruce, and white spruce in both New Brunswick and Nova Scotia; late frost damaged tamarack in New Brunswick; and ice covered and damaged jack pine in New Brunswick.

SPECIAL SURVEYS

SPECIAL SURVEYS

Several forestry projects are carried out each year that are not necessarily related to one of the forest pests of "major importance." In the past, information from these projects has either been reported elsewhere or used internally. Considering the implications this information may have in forest management, it is summarized and the results of special surveys will be included in this and future annual reports.

FOREST PEST ASSESSMENT IN PLANTATIONS

The increasing importance of planted trees in forest management resulted in the initiation of an annual plantation - assessment program in 1982. The lessons learned from agriculture and from experience with large-scale forest plantings suggest that tracts of even-aged, single species forests will bring with them special pest problems. Previously insignificant pests may take on new importance and many of the well-known pests may change their habits in the new environment. As our knowledge of pest outbreaks in plantations accumulates, our methods of establishing and tending them must incorporate ways to offset the effects of such pests if we wish to avoid or minimize losses.

Our plantation surveys will attempt to determine the status of all significant insects and diseases. At least one host species is assessed each year in selected plantations throughout the Maritimes to obtain a general picture of pest problems. This should indicate if there is a need for detailed surveys of all plantations in that specified area to be carried out in cooperation with clients. Although plantation selection is random, new plantations are avoided to eliminate problems associated with site selection and establishment techniques.

PLANTATION SURVEY OF RED PINE

Red pine plantations were assessed in 1983. The 15 plantations were distributed throughout the Region according to the prevalence of red pine and were assessed for all insect and disease conditions. The pests found and the frequency of their occurrence are listed in Table 5. In addition to this survey several pests of red pine received special attention in 1983 for various reasons. Information obtained is included below as it relates to plantations.

The European Pine Shoot Moth, Rhyaciona buoliana (Schiff.), was distinctly a Nova Scotia problem. The insect was widespread in both Nova Scotia and Prince Edward Island until the winter of 1980-1981 when unusually low temperatures caused a near collapse of the populations. Insect numbers and consequent shoot damage increased slightly in 1982 and the trend continued in 1983. In the seven plantations in Nova Scotia, 48% of the trees surveyed were infested (range 0 to 100%) and from 1 to 88% of the current shoots were affected. The top of crowns, especially the leaders, are the most likely attacked. The frequency of leader attack diminishes with tree height and becomes negligible when trees are 5 m high. Damage to leaders is of great concern because of their importance to both height growth and tree form. Up to 92% of the leaders were damaged in the worst affected plantation at East Margaree, Inverness County. In another area, 13% of the leaders were damaged although the overall shoot infestation level was only 3%. The insect is considered a pest of young trees as damage to semimature and mature trees is rare. Young trees may outgrow the effects of a short and not too severe outbreak, but the consequences of previous attacks are visible in many older plantations as trees with forked and crooked stems abound. Presently, populations of the insect are at low or moderate levels in most areas, but if the number of insects continues to increase another widespread outbreak may be building.

Table 5. Occurrence of forest insects and disease in red pine plantations in the Maritimes, 1983

	Number of plantations in which the organism was found			
	New Brunswick	Nova Scotia	Prince Edward Island	Region
Number of plantations surveyed	7	6	2	15
Insects				
European pine shoot moth	0	5	0	5
Wood and (or) bark boring insects	5	0	0	5
Pine bark aphid (*Cinara* sp.)	2	2	0	4
Aphids (other than *Cinara* sp.)	1	2	0	3
Pine bark adelgid	1	2	0	3
Spittlebugs	0	2	0	2
European pine sawfly	0	2	0	2
Red pine sawfly	0	0	1	1
Pine tortoise scale	1	0	0	1
Diseases				
Needle rust	0	2	1	3
Sirococcus shoot blight	0	1	1	2
Armillaria root rot	1	0	0	1
Scleroderris canker	0	0	0	0
Animals				
Porcupine	1	0	0	1

Wood and (or) bark boring insects - In New Brunswick the infestation of stems and branches by several species of wood and (or) bark boring insects was the most widespread condition encountered. Attention was drawn to these pests by the boring dust on stems and on larger branches. Cydia inopiosa (Heinrich) was most widespread. It was frequently found in vigorous trees but mining was always restricted to the outer bark so no apparent damage resulted. In one plantation at Meadow Brook, Kent County, about 8% of red pine trees planted in 1966 died. Site and planting problems appeared to be the predisposing factors and the pruning of lower branches of low vigor trees during 1982 added stress. The following insects were reared from material collected at this location: Asemum striatum (L.), Cydia inopiosa (Heinrich), Dendroctonus valens LeC., Filatima sp., Hylurgops pinifex pinifex (Fitch), Monochamus sp., Orthotomicus caelatus (Eich.), Pissodes sp., Pityogenes plagiatus plagiatus (LeC.), and Pityophthorus sp. Dendroctonus valens, the red turpentine beetle, was probably the most important species in this group of insects, which are usually of a secondary nature. This insect was found at the base of stems of living, decadent trees where its galleries had penetrated the cambial layer. It is possible that populations of this beetle, as well as some others will persist as long as suitable host material is available in the area.

Aphids and adelgids - These sucking insects were found in both Nova Scotia and New Brunswick. The woolly pine-needle aphid, Schizolachnus piniradiatae (Davidson) was found in one New Brunswick plantation, a Cinara sp. at two locations in each province, and other species of Aphidae were noticed in two additional plantations in Nova Scotia. Adelgids of the species Pineus were present in one New Brunswick and two Nova Scotia plantations.

Aphids and adelgids were occasionally accompanied by sooty molds but the infestations seemed to have little effect on tree vigor.

Spittlebugs, Aphrophora sp., another group of sucking insects were found in two plantations in Nova Scotia but were present only in very low numbers.

European Pine Sawfly, Neodiprion sertifer (Geoff.) was present in two plantations in Nova Scotia, affecting 2% of the trees at one location and 84% of the trees at another. The insect feeds on old foliage. In the latter plantation in Colchester County there was an average of four colonies per tree but despite this level of infestation the trees sustained only light defoliation.

Red Pine Sawfly, Neodiprion nanulus nanulus Schedl, another defoliator which feeds on old foliage, was found in one plantation in Prince Edward Island where 20% of the trees were infested.

Pine Tortoise Scale, Toumeyella parvicornis (Cock.), which prefers jack pine or Scots pine but will attack other species, was found in one red pine plantation in New Brunswick. Scales produce honey dew which in turn promotes the growth of black sooty mold. Ten percent of the lower branches on 16% of the trees were infested.

Needle Rust, Coleosporium sp., was present on more than 80% of the trees surveyed in the infected plantations, two in Nova Scotia and one in Prince Edward Island, but it affected only about 10% of the 1-year-old needles. At Brookvale, Queens County, P.E.I. the infection is of several years duration and of lessening intensity. Virtually all of the 1980 needles and 26% of the 1981 needles were either dead or missing, and 11% of the 1982 needles were infected.

Sirococcus Shoot Blight, Sirococcus strobilinus Preuss, is probably the most serious pest problem in red pine plantations in Nova Scotia and in parts of the other two provinces even though the disease was found in only one plantation in each of Nova Scotia and Prince Edward Island. The results of the special assessment survey in older plantations and some of the implications of the disease as a damaging forest pest are discussed in detail on page 10.

Armillaria Root Rot, Armillaria mellea (Vahl ex Fr.) Kummer, affected only 2% of the trees in the one plantation where it was found in New Brunswick. However, this disease is being found more and more frequently in plantations of various host species. It is not known what effect, if any, it may have in plantations in the future but judging from experience in other regions the situation bears watching.

Scleroderris Canker, Gremmeniella abietina (Lagerb.) Morelet, was not found during the survey. This is not surprising because the disease has never been known in Prince Edward Island, has not been seen in Nova Scotia since 1978, and symptom expression has been poor in New Brunswick during the past three years. It is a disease of young plantations to which red pine is especially vulnerable. As discussed on page 9 there may be an increase in new infections in the coming years.

Porcupine feeding and subsequent girdling of the trees did not appear to be a serious problem in red pine plantations although protection of high-value stands such as seed orchards may be necessary depending on local conditions.

All of these forest pests cause damage from time to time in localized areas and any of them is capable of becoming a widespread problem. We consider Sirococcus shoot blight and the European pine shoot moth as the currently most serious pests in red pine plantations, especially in Nova Scotia and Prince Edward Island.

CONE AND SEED INSECTS AND DISEASES OF WHITE SPRUCE

Plantation programs, through nursery operations, depend on seed production. Any interference with this will affect future wood supplies. Damage by insects and diseases is an important factor in reducing potential seed crops.

A project initiated in 1982 to assess damage caused by insects and diseases of white spruce seeds and cones continued in 1983. The rearing and identification of insects and the analysis of the data are not yet complete. The needle rust, Pucciniastrum americanum (Farl.) Arth. was again present on cone scales at Kerry Brook, Albert County, N.B. The number of viable uninjured seeds per cone in 1983 at the different collection sites averaged 17.4 at Camden, Colchester County, 13.8 at Wentworth, Cumberland County, 19.2 at Upper Mount Thom, Pictou County, N.S. and 7.2 at Kerry Brook, N.B. Trees did not produce cones at the Acadia Forest Experiment Station, Sunbury County, N.B.

DAMAGE ASSESSMENT IN SPRUCE-FIR STANDS

In 1983, a special survey of balsam fir and spruce was conducted in the Region to assess the condition of the forest, to determine the relative importance of the various pests causing damage, and to obtain loss estimates. Of the 185 plots assessed in the Maritimes, 76 were in New Brunswick, 95 in Nova Scotia, and 14 in Prince Edward Island. The distribution of plots within a given province was based on host volume distribution.

Estimated losses caused by the spruce budworm were based partly on the results of this survey but much of the data is still to be analyzed. Secondary insects that were found to contribute to the deterioration of spruce and fir included: Polygraphus rufipennis (Kby.), Dendroctonus rufipennis (Kby.) on spruce, Siricidae on balsam fir and Monochamus sp., Trypodendron lineatum (Oliv.), Pissodes dubius Rand., Melandryidae, and Pityoktienes sparsus (LeC.) on both spruce and fir. The Armillaria

root rot, Armillaria mellea (Vahl ex Fr.) Kumm., was also found to be an important part of the complex. Detailed results of the survey will be presented at a later date.

CYCLICAL REVIEWS FOR SPECIFIC PESTS

Many pests, although omnipresent in the forest, are not reported annually because (1) there is little fluctuation in their distribution or in the damage they cause, (2) they normally cause so little damage that regular surveys cannot be justified, or (3) they are present in such small numbers that they are easily overlooked during routine assessment surveys. However, these organisms are a part of the pest component in the forest and, although separately each may cause little damage, their combined effect can weaken the trees, reduce growth, or expose them to other problems. Forestry practices are changing and some organisms, until now obscure and unimportant in their natural habitat, are changing in importance and the damage caused by them is becoming significant.

Several of these "other" insects and diseases are reviewed each year in the Maritimes, often in connection with surveys involving a specific host species. The number depends on other activities, which determine the time available and the time required for specific surveys. The results provide an assessment of the current status of the organism and a benchmark to which past and future assessments are compared.

Northern Pitch Twig Moth, Petrova albicapitana (Busck) has also been known as the pine nodule maker. Larvae of the insect bore into the twigs of jack pine or occasionally of other pines. The copious resin flow, produced by the tree in response to the attack, hardens and forms a conspicuous nodule. Infested twigs may break off resulting in tree deformities. The younger section of the main stem may also be attacked and tops may die.

In 1983, northern pitch twig moth infested stands, both plantations and natural areas, were found throughout Nova Scotia and eastern New Brunswick, the distribution in the latter corresponding with the natural range of jack pine. The results of the survey are summarized in Table 6. The insect was most frequent in Nova Scotia although populations in most areas were not high. However, half of the infested trees in a 16-ha, 6-yr-old jack pine plantation near Slate Brook Rd., Guysborough County, N.S. had nodules on the 2-yr-old section of the main stem. Nearly one-quarter of the trees (24%) were infested in the plantation and more than one-quarter of the branches (27%) examined harbored nodules at an intensity of 1.8 nodules/m² branch area.

In addition, two small experimental plantations of lodgepole pine at the Acadia Forest Experiment Station, Sunbury County, N.B. were assessed. All

Table 6. The status of northern pitch twig moth in the Maritimes in 1983

Description	N.B.	N.S.	P.E.I.
All stands[1]			
Examined	23	15	3
Infested,%	26	73	0
Infested stands			
Trees infested,[2]%	20	26	—
Range,%	4-80	4-100	—
Infested trees			
Branches,[3]%	22	32	—
Range,%	20-30	20-76	—
Nodules/m² branch area[4]	0.4	1.86	—
Range	0.2-0.9	0.3-5.5	—

[1]Stand includes either plantations or natural stands.
[2]Based on 25 trees per location.
[3]Based on assessment of five infested trees per location.
[4]Based on five branches per infested tree.

trees in both plantations were heavily damaged. Twig and branch mortality was common and in one plantation 10% of the trees were dead. Insect populations were very high, 23.8 nodules/m^2, compared with the highest count of 5.5 nodules/m^2 found on jack pine.

Balsam Shootboring Sawfly, Pleroneura brunneicornis Roh., larvae kill new shoots of balsam fir, cause symptoms similar to frost damage, and may be of concern to Christmas tree growers.

In 1983, an assessment survey of 128 plantations and natural stands found the insect present at 16 locations scattered throughout mainland Nova Scotia and southern New Brunswick. The results are summarized in Table 7. The highest percentage of infested shoots was 12% at one location south of Denver, Guysborough County, Nova Scotia and 7% at two locations in southern Charlotte County, New Brunswick.

Table 7. The status of balsam shootboring sawfly in the Maritimes in 1983

	New Brunswick	Nova Scotia	Prince Edward Island
No. of stands examined	64	57	7
Percent of stands infested	7.8	19.8	0
Highest level of infestation (%)[1]	6.7	12.0	-

[1]Based on counts of 25 shoots on each of three trees.

Larch Needle Casts include the fungus Hypodermella laricis Tub., long known in all three Maritime provinces and Mycosphaerella laricina (Hart.) Neg., first found in North America in Wisconsin in 1980. H. laricis attacks and kills needles and short shoots. When infection is severe, affected trees have a scorched, brown appearance. No widespread infection has ever been recorded in the Region but periodically larch is affected in small areas. M. laricina is reported to cause severe defoliation of European and Japanese larch in Europe. The fungus was most likely introduced on infected nursery stock. Its presence on this continent adds yet another forest pest which may in time create problems in our increasing areas of non-native larch.

In 1983, larch was inspected in 66 areas for the presence of needle casts. M. laricina was not found in the Region on eastern larch. H. laricis infected one of 25 trees in a stand on Cape Breton Island, Nova Scotia and was found in two stands in southeastern New Brunswick. Infection in all cases was very low and only about one-third of the fascicles were discolored on affected branches.

Eastern Dwarf Mistletoe, Arceuthobium pusillum Peck, is a parasitic flowering plant which, in the Maritimes, is common on black spruce, and occurs occasionally on white spruce, red spruce, and larch. It infects twigs and branches causing swellings and abnormal bud proliferation that results in the formation of characteristic witches' brooms. Heavy infection and broom formation kill the tree. Its status was last assessed in 1967.

The assessment survey in 1982 and 1983 was conducted at 123 locations involving about 4600 merchantable-size trees, mostly black spruce. The locations and trees were evenly divided between dry and wet, boggy sites in New Brunswick and Prince Edward Island, while in Nova Scotia they were prorated according to the frequency of these sites. The results of the survey are presented in Table 8. About 20% of all stands assessed in the Region were infected but there was notable variation both among provinces and between sites. In the Maritimes, a total of 6.3% of the

Table 8. Summary of the assessment of the status of eastern dwarf mistletoe in the Maritimes in 1982-1983

Description	New Brunswick	Nova Scotia	Prince Edward Island	Region
	%			
Stands of black spruce				
- proportion with dwarf mistletoe infection	14	25	8	20
- proportion of wet boggy sites infected	29	72	17	44
- proportion of dry sites infected	0	8	0	5
Trees of black spruce				
- proportion of merchantable trees infected by dwarf mistletoe[1]				
- regardless of site characteristics	3.1	10.0	0.9	6.3
- on wet sites	6.2	36.7	1.9	15.8
- on dry sites	0	1.1	0	0.6
- proportion of merchantable trees killed by dwarf mistletoe[1]				
- regardless of site characteristics	0.4	2.9	0	1.6
- on wet sites	0.7	10.3	0	3.8
- on dry sites	0	0.5	0	0.3

[1]Infected trees include those with witches' broom but living, and trees killed by mistletoe.

trees was affected by dwarf mistletoe, including 1.6% dead. About 83% of the infected stands, 94% of the affected trees, and 89% of the mistletoe killed trees were found in wet, boggy areas, a site condition favoring the mistletoe. All infection on dry sites was found in Nova Scotia.

ACKNOWLEDGEMENTS

This report is the result of the combined effort of all members of the Forest Insect and Disease Survey: C.L. Burlock, L.J. Coady, C.M. Dobson, K.J. Harrison, J.E. Hurley, A.M. Jones, C.D. MacCall, A.W. MacKay, L.P. Magasi, O.A. Meikle, W.R. Newell, D.P. Ostaff, B.A. Pendrel, S.E. Pond and F.A. Titus. We wish to thank our summer students and the numerous staff members at MFRC who contributed in many ways. Some are mentioned in the appropriate sections of the report but special thanks go to Marg Cameron, Ed Kettela, Don Marks, and Thaddee Renault. Much of the information on the status and control of the spruce budworm is based on data provided by other organizations as listed in the appropriate chapter.

Information contributed by the Pest Detection Officers of the New Brunswick Department of Natural Resources, the Nova Scotia Department of Lands and Forests, and the Prince Edward Island Department of Energy and Forestry is acknowledged and appreciated. Special thanks go to those who participated in the gypsy moth surveys.

Parks Canada, the Department of Natural Resources of New Brunswick, the Department of Lands and Forests of Nova Scotia, the Bowater-Mersey Ltd., and private individuals operated light traps during the summer months.

The contribution and cooperation of private citizens and of personnel at all levels of industrial organizations are noted with thanks. Their effort on our behalf in so many ways not only makes our work easier but also makes us a more effective unit.

I would like to express my personal thanks to my staff who made me 'look good' on many occasions through their hard work and dedication.

LIST OF PUBLICATIONS

Reports and publications by the staff of the Forest Insect and Disease Survey and forest pest related articles by other members of the Maritimes Forest Research Centre produced in 1983. (Contributions without direct FIDS staff involvement are marked by *.)

Anonymous. 1983. The gypsy moth. A potential threat to the Maritimes. Environment Canada, Canadian Forestry Service (pamphlet).

Coady, L.J. 1983. Forest insects and diseases in Prince Edward Island National Park in 1982. MFRC Tech. Note No. 73.

*Embree, D.G. 1983. The whitemarked tussock moth. pp. 33-35 in Balsam Fir Update: A review of the latest research finding pertinent to Christmas tree culture. Compiled by A. Dickson. Proc. of a Seminar sponsored by UNB's Faculty of Forestry, April 16, 1983, Fredericton, N.B.

*Johnson, J.H., and D.G. Embree. 1983. A wood quality study of dead and dying balsam fir: Highlights and summary of the pulping studies. MFRC Tech. Note. No. 80.

*Kettela, E.G. 1983. The spruce budworm. pp. 3-17 in Balsam Fir Update: A review of the latest research findings pertinent to Christmas tree culture. Compiled by A. Dickson. Proc. of a Seminar sponsored by UNB's Faculty of Forestry, April 16, 1983, Fredericton, N.B.

*Kettela, E.G. 1983. Spruce budworm infestations in Nova Scotia in 1983 and a forecast for 1984. MFRC Tech. Note No. 96.

*Kettela, E.G. 1983. Status of spruce budworm infestations in New Brunswick in 1983 and a forecast of conditions for 1984. MFRC Tech. Note No. 100.

*Kettela, E.G. 1983. A cartographic history of spruce budworm defoliation from 1967 to 1981 in eastern North America. Can. For. Serv. Inf. Rep. DPC-X-14.

MacCall, C.D. 1983. Forest insects and diseases in Kejimkujik National Park in 1982. MFRC Tech. Note No. 76.

MacKay, A.W. 1983. Forest insects and diseases in Cape Breton Highlands National Park in 1982. MFRC Tech. Note No. 74.

*MacLean, D.A. 1983. Effects of spruce budworm (Choristoneura fumiferana) outbreaks on the productivity and stability of balsam fir (Abies balsamea) forests. Paper presented at the International symposium on "Productivity and Stability of Forest Ecosystems" held 16-18 August 1982 Tbilisi USSR. Published in Russian in Lesovedenye.

MacLean, D.A., and D.P. Ostaff. 1983. Sample size - precision relationships for use in estimating stand characteristics and spruce budworm caused tree mortality. Can. J. For. Res. 13: 548-555.

Magasi, L.P. 1983. Forest pest conditions in the Maritimes in 1982. Marit. For. Res. Cent. Inf. Rep. M-X-141.

Magasi, L.P. 1983. C.F.S. Pest Note. European Larch Canker, Canadian Forestry Service, Fredericton, N.B.

Magasi, L.P. 1983. Highlights of forest pest conditions in the Maritimes in mid-June, 1983. MFRC Tech. Note No. 86.

Magasi, L.P. 1983. Highlights of forest pest conditions in the Maritimes at the end of June, 1983. MFRC Tech. Note No. 87.

Magasi, L.P. 1983. Highlights of forest pest conditions in the Maritimes at the end of July, 1983. MFRC Tech. Note No. 91.

Magasi, L.P. 1983. Highlights of forest pest conditions in the Maritimes in mid-September, 1983. MFRC Tech. Note No. 94.

Magasi, L.P. 1983. Major forest pests in Nova Scotia in 1983. MFRC Tech. Note No. 95.

Magasi, L.P. 1983. Major forest pests in New Brunswick in 1983. MFRC Tech. Note No. 97.

Magasi, L.P. 1983. Important forest pests of larch in the Maritimes. MFRC Tech. Note No. 98.

Magasi, L.P. 1983. So what happened to Scleroderris? MFRC Tech. Note No. 99.

Magasi, L.P. (in press). The status of Scleroderris canker in the Maritime Provinces of Canada - 1983. In Proceedings of Scleroderris Symposium, Syracuse, N.Y., June 1983.

Magasi, L.P. (editor) 1983. Proceedings of European Larch Canker Workshop, Fredericton, N.B. June 28-29, 1983. MFRC Workshop Proceedings No. 3. 45 pages.

Magasi, L.P. 1983. European larch canker - the situation in Canada in 1982. pp. 11-12 in Proceedings of European Larch Canker Workshop, Fredericton, N.B. June 28-29, 1983. MFRC Workshop Proceedings No. 3. Editor L.P. Magasi.

Magasi, L.P., and W.R. Newell. 1983. The status of beech bark disease in the Maritimes Region of Canada in 1980. pp. 13-17 in Proceedings IUFRO Beech Bark Disease Working Party Conference, Hamden, Conn. Sept. 26 - Oct. 8, 1982. USDA Forest Service General Technical Report WO-37.

Meikle, O.A. 1983. Forest insects and diseases in Fundy National Park. MFRC Tech. Note No. 72.

Meikle, O.A. 1983. Forest insects and diseases in Kouchibouguac National Park in 1982. MFRC Tech. Note No. 75.

Ostaff, D.P. 1983. Activity A (Impact Studies) Spruce Budworm Research and Development Program. A Progress Report. File Report MC-M-186/6. Maritimes Forest Research Centre, Fredericton, N.B.

Ostaff, D.P. 1983. A wood quality study of dead and dying balsam fir - the incidence of Armillaria root rot. MFRC Tech. Note No. 82.

Ostaff, D.P. 1983. European Larch Canker Workshop - field trip. pp. 25-27 in Proceedings of European Larch Canker Workshop, Fredericton, N.B., June 28-29, 1983. MFRC Workshop Proceedings No. 3. Editor L.P. Magasi.

Ostaff, D.P. 1983. The importance of plant health to forestry in the Maritimes. Paper presented at Agriculture Canada, Plant Health Workshop, Halifax, N.S. Nov. 16-18, 1983.

Pendrel, B.A. 1983. Forest tent caterpillar in the Maritimes with a forecast for 1983. MFRC Tech. Note No. 81.

*Renault, T.R. 1983. Balsam gall midge. pp. 18-21. in Balsam Fir Update: A review of the latest research findings pertinent to Christmas tree culture. Compiled by A. Dickson. Proc. of a Seminar sponsored by UNB's Faculty of Forestry, April 16, 1983, Fredericton, N.B.

*Renault, T.R. 1983. Balsam twig aphid and balsam gall midge. MFRC Tech. Note No. 80.

*Thomas, A.W. 1983. Periodicity in the responsiveness of male spruce budworm (Lepidoptera: Tortricidae) to synthetic sex attractant. Can. Ent. 115:713-714.

*van Raalte, G.D. 1983. Relationship between moisture content and wood decay in spruce budworm killed balsam fir. MFRC Tech. Note No. 104.

*Varty, I.W. 1983. Balsam twig aphid. pp. 22-25 in Balsam Fir Update: A review of the latest research findings pertinent to Christmas tree culture. Compiled by A. Dickson. Proc. of a Seminar sponsored by UNB's Faculty of Forestry, April 16, 1983, Fredericton, N.B.

*Wall, R.E. 1983. Fireblight of wild raspberry on clear-cut forest areas. Can. For. Serv. Res. Notes 3:2-3.

*Wall, R.E. 1983. Mortality of juvenile yellow birch. Can. For. Serv. Res. Notes 3:11-12.

OTHER INSECTS AND DISEASES

OTHER INSECTS AND DISEASES

This table lists, alphabetically by common name, most insects and diseases encountered in the Maritimes in 1983 not discussed in detail. Inclusion in the table does not imply that the organism is necessarily of lesser economic importance than those discussed in the text. It may be that an organism, e.g., whitemarked tussock moth, is at an ebb of biological activity and did not cause enough concern in 1983 to warrant detailed discussion. It may be that although "severe", an organism, e.g., Douglas fir needle blight, was only of localized importance in 1983.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Alder flea beetle *Altica ambiens alni* Harr.	Alder	Region	Pockets of moderate and severe leaf browning throughout mainland Nova Scotia and in Richmond County on Cape Breton Island; in Kings and Queens counties, P.E.I.; Charlotte, Kings, and Madawaska counties, N.B.
Alleghenys spruce beetle *Dendroctonus punctatus* LeC.	White spruce	N.B.	Collected at Pineville, Northumberland County. This is the first authenticated record for the Region in recent years. This species attacks standing or fallen trees but is not considered of economic importance because of its apparent inability to compete with the more aggressive spruce beetle, *Dendroctonus rufipennis* (Kby.)
Ambermarked birch leafminer *Profenusa thompsoni* (Konow)	White birch	N.B.	At scattered locations in western New Brunswick often in combination with the birch leafminer, *Fenusa pusilla* (Lep.) at various levels of intensity.
Anthracnose of maple *Kabatiella apocrypta* (Ell. & Ev.) Arx	Red maple	N.B.	Light damage to ornamental trees at Petitcodiac, Westmorland County, Fredericton, York County, and Perth-Andover, Victoria County.
Ash rust *Puccinia sparganioides* Ell. & Barth.	Ash	N.B. N.S.	In Nova Scotia, severe twig mortality of ornamental trees in Shelburne, Shelburne County. Moderate or severe leaf browning at Lunenburg, Lunenburg County; Springhaven and Kemptville, Yarmouth County; Weymouth and Weymouth North, Digby County. Light or moderate near Middle Cape, Cape Breton County, and Smiths Cove, Digby County. Also occurred in New Brunswick.

Aspen leafroller *Pseudexentera oregonana* Wlshm. Darkheaded aspen leafroller *Anacampsis innocuella* Zell. Spotted aspen leafroller *Sciaphila duplex* Wlshm.	Largetooth aspen Trembling aspen	Region	Both aspen leafroller and the spotted aspen leafroller prevalent this season with the darkheaded aspen leafroller much less abundant. Present at various levels of intensity throughout, but most common in southern New Brunswick, central and Annapolis Valley areas of Nova Scotia, and Prince Edward Island.
Aspen mortality	Trembling aspen	N.B.	Mortality of about 50% of the aspen trees in a ±20-ha area at St. Hilaire, Madawaska County. Armillaria root rot, hypoxylon canker, and borer damage common.
Aspen skeletonizer *Phratora purpurea purpurea* Brown	Balsam poplar Trembling aspen	N.B. P.E.I.	In New Brunswick, common causing light leaf skeletonizing of scattered balsam poplar trees at Canoose, Charlotte County. In Prince Edward Island, browning of 20-40% of the leaves of some trembling aspen at Orwell, Emyvale, North Wiltshire, and Brookfield, Queens County, and Middleton, Prince County.
Balsam fir sawfly *Neodiprion abietis* complex	Balsam fir Red spruce	N.B. N.S.	Populations low. Collected at locations in York and Carleton counties, N.B., and Annapolis, Pictou, and Guysborough counties, N.S.
Balsam woolly adelgid *Adelges piceae* (Ratz.)	Balsam fir	Region	Populations continued low in most of the Region with a slight resurgence in some areas of New Brunswick. Damage severe in some of the Christmas tree growing areas of Nova Scotia, particularly some locations in Lunenburg County.
Birch casebearer *Coleophora serratella* (L.)	Alder White birch Wire birch	Region	Widespread throughout the Region, most frequently on white birch, often on alder, and occasionally on wire birch. In New Brunswick, populations mainly low in the northern part of the Province, with patches of leaf browning at various levels of intensity at locations in the eastern parts of Northumberland, Kent, and Westmorland counties and southern Charlotte County. In Nova Scotia, the greatest concentration of populations and leaf damage in the eastern counties and on Cape Breton Island. In Prince Edward Island, patches of moderate and severe leaf browning throughout.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Birch leafminer *Fenusa pusilla* (Lep.)	White birch Wire birch	Region	Once again abundant throughout most of the Region, often causing severe browning, particularly on wire birch. Average amount of leaves affected were 16% in New Brunswick (66 locations), 21% in Nova Scotia (12 locations), 35% in Prince Edward Island (14 locations).
Birch skeletonizer *Buccalatrix canadensisella* Cham.	White birch	N.B. N.S.	Population levels remained low. The insect periodically occurs in epidemic numbers, skeletonizing the leaves of its principal host, white birch. In 1983, collected at locations in Gloucester and Charlotte counties, N.B., Cape Breton, and Cumberland counties, N.S.
Browning of larch shoots and branches	Tamarack	N.S. P.E.I.	This condition of unknown cause was found at points scattered throughout much of Nova Scotia but was most prevalent in the eastern part of the Province. Moderate and severe damage of scattered trees at McClures Mills, Colchester County; Giants Lake, Guysborough County; along Rte. 347 Aspen to Eden Lake, Guysborough and Pictou counties; Lower Barneys River, Pictou County; moderate damage at Soldiers Cove, Richmond County; and at Maple Grove and Kennetcook, Hants County. In Prince Edward Island, observed at Montague, Kings County.
Cedar leafminers *Argyresthia aureoargentella* Brower *Argyresthia freyella* Wlshm. *Argyresthia thuiella* (Pack.) *Pulicalvaria thujaella* (Kft.)	Cedar	Region	In New Brunswick moderate browning from Martinon on Highway #7 to the junction of Highway #1 (ca. 10 km) in St. John County. Premature loss of much of the older foliage and heavy current attack in many cedar swamps in the west central part of the Province. In Nova Scotia, browning of ornamentals at a few locations in Annapolis, Halifax, and Victoria counties. Moderate and high populations continued in the St. Eleanors, Muddy Creek, Sandy Cove, and Miscouche areas, with moderate browning at Freeland, Prince County, P.E.I.

Cedar tree borer *Semanotus ligneus* (F.)	Cedar	N.B.	About 3-5% of cedar trees dead or in decadent condition over about 700 km² in the Portage Lakes area of Northumberland and Restigouche counties. The borer present in all trees examined. In addition, some trees infected by Armillaria root rot. Most trees attacked and many dying or dead along Hwy #7 from Martinon to the junction of Highway #7 and #1., St. John County.
Cherry blight	Pin cherry	Region	Widespread throughout the Region, sometimes causing severe foliage browning particularly in Prince Edward Island.
Cherry casebearer *Coleophora pruniella* Clem.	Trembling aspen	P.E.I.	Populations continued low, with moderate and severe browning restricted to a few areas less than 2 ha in size in Queens and Kings counties.
Cone rust *Pucciniastrum americanum* (Farl.) Arth.	White spruce	N.B.	Found on white spruce cones at Kerry Brook, Albert County, N.B.
Diplodia tip blight *Sphaeropsis sapinea* (Fr.) Dyko & Sutton	Austrian pine	N.S.	New record for the Region. On an ornamental tree at Bible Hill, Colchester County, N.S.
Douglas fir needle blight *Rhabdocline* sp. and Douglas fir needle cast *Phaeocryptopus gaeumannii* (Rodhe) Petr.	Douglas fir	N.B. N.S.	Light and moderate damage at Barss Corner, Lunenburg County, in a 1.2-ha plantation where severe reddening and needle drop occurred in 1982. Not reported in New Brunswick in 1983.
Eastern blackheaded budworm *Acleris variana* (Fern.)	Balsam fir Black spruce Red spruce White spruce	Region	Populations low throughout the Region with the highest numbers at locations in Sunbury, and Gloucester counties, N.B. Light defoliation in parts of Victoria and Inverness counties, N.S.
Eastern spruce gall adelgid *Adelges abietis* (L.)	Norway spruce Red spruce White spruce	Region	Common throughout the Region but causing little damage. A survey of 23 points distributed throughout western New Brunswick showed 6.4% of the new shoots affected; at 9 points in Prince Edward Island damaged shoots averaged 1%.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Eastern tent caterpillar *Malacosoma americanum* F.	Apple Cherry Trembling aspen	Region	Generally more abundant than last year. In New Brunswick nests common on roadside cherry bushes and apple in the southern half of the Province. Nests common in the central, Valley, western and south shore of Nova Scotia. Found at a few locations in Kings and Queens counties, P.E.I.
Elm leaf beetle *Pyrrhalta luteola* (Mull.)	Elm	N.B.	Severe leaf browning of ornamental trees in Fredericton, York County.
Elm leafminer *Fenusa ulmi* Sund.	English elm	Region	In Nova Scotia, various levels of leaf browning, often severe in Nova Scotia on ornamentals in many communities in Annapolis, Cape Breton, Colchester, Cumberland, Hants, Inverness, Kings, Halifax, Lunenburg, Pictou, Queens, and Yarmouth counties. In Prince Edward Island, moderate and severe leaf injury at few locations scattered throughout the Province. In New Brunswick, browning restricted to two locations in Westmorland County.
European pine sawfly *Neodiprion sertifer* (Geoff)	Jack pine Mugho pine Red pine Scots pine	N.S. P.E.I.	Collected in plantations and (or) ornamental trees at scattered locations in Colchester, Cumberland, Halifax, Lunenburg, Pictou, and Cape Breton counties, N.S. and in a red pine plantation at Brookvale, Queens County, P.E.I.
European pine shoot moth *Rhyacionia buoliana* (Schiff.)	Pine	Region	Populations increased in 1983 (See Plantation survey of red pine p. 24). In addition, ornamental trees, mostly pine were damaged in several areas.
European spruce sawfly *Gilpinia hercyniae* (Htg.)	Black spruce Red spruce White spruce	Region	Populations of this potentially destructive introduced sawfly remained at low levels, widely distributed throughout the Region.
Fall webworm *Hyphantria cunea* (Dru.)	Deciduous	Region	Mainly on roadside trees and bushes at various locations in all counties of Prince Edward Island. Scattered throughout western Nova Scotia, and at Cookville, Westmorland County, N.B.

Frost damage	Conifers Hardwoods	Region	Damage widespread and severe in isolated areas of New Brunswick and Prince Edward Island. In Nova Scotia damage was prominent in hardwoods and in the central part of the Province some oak stands sustained an almost total loss of the first crop of leaves.
Globose gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	Jack pine	Region	Common throughout. In New Brunswick at Penobsquis, Kings County, an average of 8.4 galls per tree (range 0 to 31), trees with dead twigs and branches harboring hundreds of galls present in area; at Kouchibouguac National Park, Kent County, red flagging moderate and severe, some small scattered trees have been killed. In Nova Scotia, at Salt Springs Station, Cumberland County, 7 of 25 trees infected with 1 or 2 galls per tree. In Prince Edward Island, 5 galls were found on each of three 50 cm branches on 1 tree at East Bideford, Prince County.
Grease banding	Sugar maple	N.B.	At Woodstock, Carleton County, crown mortality of a few trees banded with petroleum based grease to prevent invasion by forest tent caterpillars; the coral canker (*Nectria cinnabarina* (Tode ex Fr.) Fr.), is present as a secondary organism. A 15-year-old maple tree died at Fredericton, York County from the same cause.
Greenstriped mapleworm *Dryocampa rubicunda rubicunda* (F.)	Maple	Region	Populations of this periodically important defoliator of maple remained low.
Hemlock looper *Lambdina fiscellaria fiscellaria* (Guen.)	Conifers Hardwoods	Region	Populations low, present on various hosts at points scattered throughout the Region. More common in Nova Scotia than in the other two provinces.
Ink spot of aspen *Ciborinia whetzelii* (Seaver) Seaver	Trembling aspen	N.B. P.E.I.	At various locations in New Brunswick mainly in the western part of the Province, present at 9 of 21 locations assessed where leaf infection ranged from 2 to 20%, except in the Becaguimec Game Management Area, York County where up to 60% of leaves were infected on some trees. In Prince Edward Island, 2 and 7% infection recorded at two locations in Queens County.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Larch casebearer *Coleophora laricella* (Hbn.)	Tamarack	Region	Populations remained generally low throughout the Region but somewhat higher than last year. Needle mining was trace but at occasional points reached light in New Brunswick, moderate in Nova Scotia, and severe in Prince Edward Island.
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack	Region	Populations of this important defoliator of larch remained low throughout the Region; found only at two locations in Prince Edward Island and at one in New Brunswick.
Leaf blisters *Taphrina carnea* Johanson *Taphrina dearnessii* Jenkins Jenkins *Taphrina letifera* (Pk.) Saccardo *Taphrina populina* Fries	Mountain maple Red maple Trembling aspen	Region	About 50% of leaves affected on several ornamental trembling aspen trees (*T. populina*) at Philips Harbour, Guysborough County, N.S. Scattered elsewhere in northern New Brunswick, found at one location in Prince County, P.E.I.
Leaf blotch of horse-chestnut *Guignardia aesculi* (Peck) V.B. Stew.	Horse-chestnut	Region	Varying degrees of leaf browning at localities in Carleton, Kings, Kent, St. John and Charlotte counties, N.B. Foliage browning light to severe on ornamental trees in Digby, Yarmouth, Annapolis, Pictou, Cape Breton and Victoria counties, N.S., and at points scattered throughout Prince Edward Island.
Leaf spot *Guignardia populi* G. Thompson	Trembling aspen	N.B.	Almost complete browning of most trembling aspen over 0.5 ha at Meadow, Albert County. Common over about 5 km² near Ratters Corner, Kings County and affecting a small group of trees at Middle Tetagouche Lake, Restigouche County.
Leaf spots of maple *Phleospora aceris* (Lib.) Sacc. *Phyllosticta minima* (Berk. & Curt.) Underw. & Earle	Mountain maple Red maple Sugar maple	Region	Widespread throughout the Region particularly on red maple. A survey at 12 scattered locations showed that 49% of the leaves were spotted to some extent.

Leaf spot of poplar *Drepanopeziza tremulae* Rimpau Leaf rust of poplar *Melamspora medusae* Thuem.	Trembling aspen	Region	In New Brunswick leaf spot and (or)leaf rust caused various amounts of browning in Gloucester, Northumberland, Carleton, York, Charlotte, Sunbury, Kings, Albert and Westmorland counties. Browning severe at St.Isadore, Gloucester County; Derby, Northumerland County; Kierstead Mountain, Kings County and moderate at Douglastown, Northumberland County. In Nova Scotia, moderate browning occurred at various locations in Cumberland, Colchester, Cape Breton, Hants, Digby, Annapolis, and Kings counties. In Prince Edward Island, moderate and/or severe browning in pockets throughout Queens, east Prince, and southern Kings County.
Leaf and twig blight of aspen *Venturia macularis* (Fr.) E. Muell. & Arx	Trembling aspen	Region	Widespread throughout New Brunswick and Prince Edward Island, present in Cumberland, Pictou, Lunenburg, Yarmouth, Annapolis and Kings counties N.S. Average shoot mortality of 14% in western New Brunswick (27 locations) and 20% in Prince Edward Island (6 locations).
Lesser maple spanworm *Itame pustularia* Gn.	Red maple	N.B.	A serious defoliator of red maple periodically, the insect has been at low population levels for the past several years. While only trace defoliation occurred this year, was widespread in New Brunswick and mainland Nova Scotia.
Maple leafroller *Cenopis acerivorana* MacK.	Red maple Sugar maple	Region	Leafrolling of maple, particularly red maple, was common throughout much of the Region. Average number of leaves rolled was 7.7% in New Brunswick (43 locations), 1.2% in Nova Scotia (21 locations), 13% in Prince Edward Island (8 locations). Severe leaf rolling in patches totalling 7000 ha in Kings County, P.E.I. The level of leaf rolling decreased from moderate in 1982 to light in 1983 on the almost 19 000 ha area in Cape Breton Island.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	Mountain-ash	Region	This perennial pest widespread in the Region causing light to complete defoliation of individual trees.
Needle cast *Lophodermium pinastri* (Schrod. ex Hook.)Chev.	Red pine	P.E.I.	Mortality of 3-0 seedlings planted in 1983 averaged 38.7% (range 7.0 to 60.0%) while 2-0 seedlings planted in 1982 were healthy in the 12 plantations examined. Although the fungus was present on most trees, other causes such as seedling storage, planting techniques, drought, and insects contributed to the mortality.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Needle cast of balsam fir *Lirula nervata* (Darker) Darker	Balsam fir	Region	Present at a few locations in Sunbury, Victoria, Madawaska, Restigouche, and Northumberland counties, N.B. Shelburne, Antigonish, and Annapolis counties, N.S.; and in Kings County, P.E.I.
Needle cast of jack pine *Davisomycella ampla* (Davis) Darker	Jack pine	N.B. N.S.	In New Brunswick, at Penobsquis, Kings County 80-100% of 1982 needles infected on 20% of the trees in a small (1 ha) area; lower branches on 12% of trees infected in a plantation at Creek Road, Kings County. In Nova Scotia, moderate infection on 4% of trees at Indian Fields, Shelburne County.
Needle rust of balsam fir *Pucciniastrum epilobii* Otth *Pucciniastrum goeppertianum* (Kuehn) Kleb. *Pucciniastrum* sp. *Milesina* sp. *Uredinopsis* sp.	Balsam fir	Region	Present at low levels throughout the Region. Average 2.5% needle infection at 46 scattered locations assessed.
Needle rusts of pine *Coleosporium asterum* (Diet.) Syd. *Coleosporium viburni* Arth.	Jack pine Red pine Scots pine	Region	Common in plantations and ornamentals throughout. In New Brunswick, at Hector Road, Northumberland County jack pine trees deteriorating from several years of severe infection; north of Chipman-Doaktown Road, Northumerland County half of the non-current needles infected in a jack pine plantation (25 ha); near Howard, Northumberland County severely infected plantation; near New Scotland, Westmorland County all pine plantations infected, 84% of trees severely in one plantation. In Nova Scotia, at Kelly Road, Chignecto Game Sanctuary, Cumberland County, 73% of 1982 needles infected; severe and moderate infection elsewhere in Cumberland County. In Prince Edward Island, present in Queens County (see Plantation survey of red pine p. 24).

Needle rust of spruce *Chrysomyxa ledicola* Lagerh. *Chrysomyxa* sp.	Black spruce Colorado blue spruce White spruce	Region	Present at scattered locations throughout, generally at low levels; but 48% of needles infected at Old Barns, Colchester County, N.S. on a small group of trees and 39% of needles in understory regeneration infected at Vernon River, Queens County, P.E.I.
Pine gall weevil	Red pine	N.B.	In New Brunswick, spindle-shaped galls common in areas in natural stands along the Mount Pleasant Road in Sunbury County; also found at Flowers Cove, Queens County and near the Dungarvon River, Northumberland County. Reported from Claremont Provincial Park, Kings County, N.S.
Poplar leaffolding sawfly *Phyllocolpa* sp.	Trembling aspen	Region	Average of leaves affected 1.4% in New Brunswick (15 locations), 16.9% in Nova Scotia, mainly eastern and central (11 locations), 5.9% in Prince Edward Island (12 locations).
Poplar leafmining sawfly *Messa populifoliella* (Town.)	Carolina poplar Lombardy poplar Trembling aspen	Region	Scattered throughout the Region, but was a problem only at Fredericton and Meductic, York County, N.B., mining the leaves of Carolina and (or) Lombardy poplar.
Poplar serpentine leafminer *Phyllocnistis populiella* (Cham.)	Trembling aspen	Region	In New Brunswick, populations again high in the northern one-third of the Province, with moderate and severe damage of leaves at many locations. Average of leaves affected at 94 locations, mainly within outbreak area was 51%. In Nova Scotia, insect occurred in Cumberland, Colchester, and Hants counties. In Prince Edward Island, populations low, average of 6% of leaves affected at 10 locations assessed.
Red pine sawfly *Neodiprion nanulus nanulus* Schedl	Austrian pine Mugho pine Red pine	N.S. P.E.I.	Common on ornamental pines at Truro and Bible Hill, Colchester, County at Halifax, Halifax County, N.S. In a red pine plantation at Brookvale, Queens County, P.E.I.
Root and bark weevils *Otiorhynchus ovatus* (L.) *Hylobius* sp. *Pissodes* sp.	Norway spruce White spruce Red pine	N.S.	Caused mortality of seedlings in plantations at Springfield, Antigonish County.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Saddled prominent *Heterocampa guttivitta* (Wlk.)	Beech Red maple Sugar maple	Region	Populations of this destructive defoliator remained at low levels, except near North Kemptville, Yarmouth County, N.S. where defoliation occurred in patches (some severe) within a 55-ha area.
Satin moth *Leucoma salicis* (L.)	Carolina poplar Largetooth aspen Lombardy poplar Silver poplar Willow	Region	Widespread throughout the Region, particularly abundant on the preferred host, silver poplar. In New Brunswick, found usually on ornamentals but sometimes in forest stands, occasionally mixed with the forest tent caterpillar. Areas in Northumberland, Carleton, York, Sunbury, Charlotte, Kings, Kent, and Westmorland counties were affected. A 1500-ha forest stand near Shediac, Westmorland County, where 50% skeletonizing occurred late in the summer of 1982, and where high populations of satin moth were anticipated this year was completely defoliated by forest tent caterpillar and only few satin moth larvae were found. This season, late summer skeletonizing of trembling aspen occurred over 1500 ha in Northumberland County north from Popple Depot along Portage Brook and over 1500 - 2000 ha east from Popple Depot along the Nepisiquit River. In Nova Scotia, defoliation of ornamentals occurred at locations in Cape Breton, Pictou, Inverness, Richmond, Colchester, and Annapolis counties. In Prince Edward Island, widespread and often severe defoliation of ornamentals at many locations throughout.
Spider mites *Oligonychus ununguis* (Jac.) *Eurytetranychus* n. sp.	Conifers	N.B. N.S.	In New Brunswick, populations declined dramatically from the levels resported last year. In some areas, old damage still evident with premature browning and loss of older foliage. Mites found at various locations in the Province but not in damaging numbers. In Nova Scotia, recorded on ornamental cedars at Antigonish, Antigonish County and in a Christmas tree plantation at Noel Shore, Hants County, and at damaging levels in a plantation at New Ross, Lunenburg County.

Spruce bud midge *Rhabdophaga swainei* Felt	Spruce	Region	Populations of this bud-destroying insect remained low throughout the Region. Number of buds killed average 2.5% in New Brunswick (23 locations, mainly in western New Brunswick), 2.1% in Nova Scotia (13 locations), 3.1% in Prince Edward Island (11 locations).
Spruce bud scale *Physokermes piceae* (Schr.)	Black spruce Red spruce White spruce	N.B.	Populations persisted in the spruce plantations in Victoria and Madawaska counties but damage appeared negligible. Also found at Salem, Queens County, Lisson Settlement Road, and near Sussex Corner, Kings County.
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	Spruce	N.B. N.S.	Populations low. Collected at locations in Restigouche, Northumberland, Sunbury, and Westmorland counties, N.B.; Antigonish, Pictou, Halifax, and Colchester counties, N.S.
Sugar maple borer *Glycobius speciosus* (Say)	Sugar maple	Region	The borer attacks, damages, and sometimes kills sugar maple trees. It is an ongoing problem for syrup producers. Observations indicate that the insect is present at many locations in all three provinces.
Stillwell's Syndrome (sudden death of balsam fir trees)	Balsam fir	N.B.	Balsam fir trees stressed by repeated budworm defoliation are susceptible to attack by a regime of organisms normally considered to be of a secondary nature. The group includes bark beetles and weevils, sawyer beetles, horntailed wood wasps, Armillaria root rot, and many others. This condition was particularly prevalent in western and southern New Brunswick from Victoria to Charlotte County and eastward to Westmorland County in 1982. This year, Stillwell's Syndrome was much reduced and reported from only a few locations involving single or small groups of trees in Victoria, Restigouche, Northumberland, and Sunbury counties.
Twoleaf tiers *Psilocorsis* spp.	Largetooth aspen Red oak Trembling aspen White birch	Region	Leaf injury generally minimal but common enough at places to be readily observed. Found in Northumberland, Sunbury, Queens, and Charlotte counties, N.B.; in Cumberland, Colchester, Pictou, Halifax, Queens, Kings, and Shelburne counties in N.S.; and in Queens County, P.E.I.
Twig pruner *Elaphidionoides villosus* (F.)	Red oak	N.B. N.S.	Attacking and causing twig drop of ornamental trees at a few locations in Charlotte and Sunbury counties, N.B.; and in Hants County, N.S.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Uglynest caterpillar *Archips cerasivoranus* (Fitch)	Cherry	Region	A noteworthy increase in populations since 1982. Roadside nests recorded in Gloucester, Northumberland, Victoria, York, Queens, Charlotte, Kings, and Albert counties, N.B.; in Hants and Annapolis counties, N.S. and Queens County, P.E.I.
White pine needle blight	White pine	Region	This condition results in browning of needles, often affecting just the tips. It may occur on individual or small groups of trees. Mature or semimature trees are most frequently affected but may be found on younger trees. The cause of this condition is unknown. Foliage discoloration was present at many locations scattered throughout much of New Brunswick, in Hants, Lunenburg, Queens, Yarmouth, Annapolis, and Pictou counties, N.S. and in Queens County, P.E.I.
Whitemarked tussock moth *Orgyia leucostigma* (J.E. Smith)	Conifers	Region	Populations of this economically important forest pest remained at endemic levels.
White pine weevil *Pissodes strobi* (Peck)	White pine Norway spruce	Region	Caused damage by killing leaders of young white pine, Norway spruce, and other conifers throughout the Region.
Willow blight *Venturia saliciperda* Nuesch	Willow	Region	Present, often moderate or severe in intensity, throughout much of New Brunswick; in Digby, Annapolis, Kings, Colchester, Pictou, Antigonish, Guysborough, and Cape Breton counties, N.S.; and in Queens County, P.E.I.
Willow flea weevil *Rhynchaenus rufipes* (LeC.)	Poplar Willow	Region	Typically, the insect mines the leaves of ornamental willows, most commonly of bayleaf willow. Leaf browning, often moderate or severe in intensity, common in New Brunswick, particularly in Gloucester and Westmorland counties. In Nova Scotia, intensity of browning variable in Antigonish, Cape Breton, Victoria, Halifax, Lunenburg, Annapolis, Hants, Colchester, and Pictou counties. In Prince Edward Island, severe browning of bayleaf willow at Stanhope and North River, Queens County, Bideford and Ellerslie, Prince County.

Wind and ocean salt spray damage	Poplar Tamarack Wire birch	Region	Wire birch trees killed along the waterfront at Kelly's Beach, Kouchibouguac National Park, Kent County, N.B. In Nova Scotia, 95% of the trees killed in a small poplar stand on the south side of Antigonish Harbour, Antigonish County. In Prince Edward Island, moderate browning of tamarack trees with a northwest exposure along the coast between Fairfield and St. Margarets, Kings County.
Wind damage	Balsam fir Maple Poplar Spruce	N.B.	A windstorm in early August broke or uprooted trees in many patches (less than 0.5 ha) over most of northwestern Carleton County, from Kenneth to Juniper and Deersdale, N.B.
Winter drying	Black spruce Jack pine Scotch pine White spruce	N.B. N.S.	Occurred at few isolated locations in southern New Brunswick and noted in a plantation in Pictou County, Nova Scotia.
Yellowheaded spruce sawfly Pikonema alaskensis (Roh.)	Black spruce Norway spruce Red spruce	Region	In New Brunswick, collected only at Heathland, Charlotte County, where moderate and severe defoliation of a few roadside white spruce occurred. In Nova Scotia, occurred at a few locations in Inverness, Victoria, Antigonish, Halifax, Kings, and Lunenburg counties, but no significant defoliation was reported. In Prince Edward Island, severe defoliation of a red spruce hedge at Oyster Bed Bridge, Queens County, light and moderate in a small black spruce plantation (less than 0.5 ha) at Brookvale, Queens County.
Yellow witches' broom of balsam fir Melampsorella caro-phyllacearum Schroet.	Balsam fir	Region	In New Brunswick, witches' brooms common throughout Fundy National Park, Albert County. In Nova Scotia, brooms reported from an area 2 km southwest of Port Mouton, Queens County, and at Parrsboro, Cumberland County. In Prince Edward Island, found in a plantation near Crapaud, Queens County.